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THE NAUTILUS

Vol. 67 JULY, 1953 No. 1

MATERIALS FOR A REVISION OF EAST COAST AND FLORIDAN VOLUTES

By HENRY A. PILSBRY and AXEL A. OLSSON

The Volutidae are comparatively rare shells in the Recent fauna of eastern North America and the Caribbean region, and most species can be obtained only by dredging in off-shore waters. *Scaphella* has recently become more easily available to collectors from the shrimp trawlers. *Voluta musica* and its several subspecies or varieties is probably the commonest of the West Atlantic volutes and is locally plentiful along certain portions of the north coast of South America from the Goajira peninsula of Colombia eastward to Margarita Island and Trinidad. Westward of the Goajiras, *V. musica* is replaced by *V. virescens,* which extends northward along the Central American coast to Texas. We have records of *virescens* from Cartagena, Colombia, and Colon, Panama. These two species are distinguishable by their color markings and by very marked differences in their nuclear construction. A fossil form of *V. virescens* is common in the Miocene of western Panama and Costa Rica.

In Florida waters only the Scaphellinae appear to be represented. An important paper on this subfamily was published by William J. Clench in Johnsonia, vol. 2, no. 22, 1946. Clench's work was based on a study of the combined collections in the National Museum, the Academy of Natural Sciences of Philadelphia, the Museum of Comparative Zoology, and the Museo Poey in Havana. It is the indispensable foundation for further work on these elegant but elusive mollusks.

In recent years the McGinty brothers, together with Arthur

R. Thompson, in dredging operations from Mr. Thompson's motor yacht *Triton,* principally along the southeast coast of Florida and the Keys, have brought together a series of *Aurinia* and its allies probably larger than any collection previously available for study. The material and information assembled by them, together with Thomas L. McGinty's studies of the radulae, form the chief basis of this paper. We are deeply indebted to Mr. Charles R. Locklin and to Mr. Thomas L. McGinty for gifts of rare and valuable specimens, and to Mr. Tom Dow and Mrs. E. L. Townsend for the use of volutes from their collections.

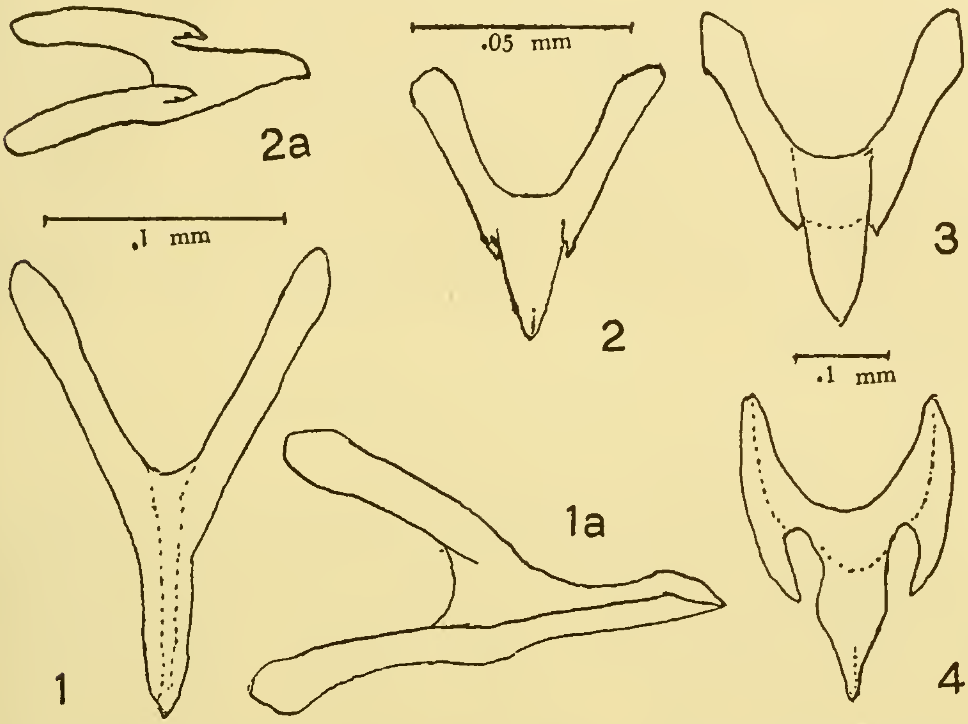
Clench first indicated the existence of a radula in the American species of Scaphellinae, and gave figures of the teeth of five species. Dall, who had failed to obtain a radular ribbon from a specimen (erroneously) identified as "*Aurinia dubia*" dissected for the *Blake* report, 1889, concluded that the absence of a radula constituted a characteristic of the subfamily, an error copied later by Thiele and several other systematists. The radular ribbon of the Scaphellinae, as in most other volutes, is uniserial, lateral teeth being absent, so that only the central row or rachidian teeth remain. The ribbon is small to minute. As figures 1 to 4 show, the teeth of *Scaphellinae* are of three patterns. All have a biramose base of attachment.

1. In Scaphella the teeth have a single long, narrow cusp only, its upper surface deeply concave (as in fig. 1a), the shanks of the base either shorter than the cusp, as in *S. junonia* as figured by Clench, or longer and more spreading, as in the Campeche race or subspecies drawn in our figures 1, 1a.

2. In Clenchina there is a conic central cusp deeply concave above, suggesting the upper surface of a rounded shovel (fig. 2a), and two minute accessory cusps, which are the sharpened ends of two ridges continued from the lateral edges of the basal shanks. The radula is minute, about 2 mm. long, teeth 0.05 mm. wide, more or less, in the type species *C. dohrni* (Sowerby), figs. 2, 2a. The teeth are similar in *C. florida* (Cl. & Ag.), and in *C. robusta marionae,* fig. 3.

3. In Aurinia there is a pointed central cusp and two well developed side cusps. The radula is relatively large, in the neighborhood of 10 mm. long, with teeth about 0.2 mm. wide, in *A. georgiana* (Clench), fig. 4. *Aurinia kieneri ethelae* (pl. 3, fig. 1), has a radula very similar to *A. georgiana.*

In *Volutifusus* the teeth are shaped as in *Aurinia,* but the radula is much smaller, 2 mm. long in a shell of *V. torrei* (Pilsbry) 54 mm. long, according to Clench.



Figs. 1, 1a. Tooth of *Scaphella junonia butleri* from shrimping grounds southwest of Campeche in 16 fms. Shell 112 mm. long. Radula about 6 mm. long, with approximately 210 teeth, formula 0.1.0. At fig. 1a a tooth viewed obliquely from side and above.

Figs. 2, 2a. *Clenchina dohrni* from rocky reef southeast of Sombrero Key Light, 110 fathoms. Shell 43.3 mm. long, clean and not eroded. Radula about 2 mm. long, with approximately 120 teeth. At fig. 2a a tooth seen from side and a little above.

Fig. 3. *Clenchina robusto marionae* from shell figured on pl. 2, fig. 5, Scale about same as for fig. 2.

Fig. 4. *Aurinia georgiana* from off Palm Beach, 115 fms. Radula slightly less than 10 mm. long, with about 160 teeth.

All figures except fig. 3 traced from camera lucida drawings by Thomas L. McGinty.

Classification of East Coast and Floridan Volutidae

Subfamily Scaphellinae

Genus Scaphella Swainson, 1832

Type by subsequent designation, Gray, 1847: *Voluta junonia* Shaw. Recent, Florida coasts westward into the Gulf of Mexico.

The shell is broadly spindle-shaped, medium or thick-walled, the spire a third the total length or less. Protoconch subtruncate, stump-shaped, often with a pointed calcarella. Early postnuclear whorls having small axial ribs and spiral striae, the last whorl with spiral striae weak or vanishing and an extremely thin and pale periostracum, usually scarcely noticeable. Columella margin of aperture nearly straight, bearing four plaits. Parietal callus a thin and transparent glaze, at its widest extension covering about half the width of the ventral face or less. The anterior canal is rather short, stout, slightly recurved, with deep terminal notch and a distinct but low siphonal fasciole. Teeth of the radula with a single cusp (as described on page 2 and figs. 1, 1a).

Clenchina, new genus

Type: *Voluta dohrni* Sowerby, 1903.

The shell is fusiform, similar to *Scaphella* by the nucleus, the numerous rows of spots, usually 8 or more (rarely wanting), and the limited parietal glaze, restricted to the columellar half or less of the ventral surface of the shell (pl. 1, fig. 4, *C. dohrni*). Three of four plaits emerge on the columella. A siphonal fasciole is more or less evident. The early postnuclear whorls may have spiral striation only, or axial ribs may be present also. Fine spiral striation extends upon the last whorl. The radula is very minute, the teeth having mesocone and vestigial side cusps, as described on page 2 and figs. 2, 2a, 3.

This genus differs from *Scaphella* chiefly by the form of the radular teeth, which are shorter and have distinct though minute side cusps. Such differences as exist in the shells do not seem very important, the *Clenchinae* being somewhat less solid and less shouldered.

Clenchina differs from *Aurinia* mainly by the much more minute radula, with teeth having only rudimentary side cusps. The shell differs by the stronger columellar plaits, the more numerous rows of spots, and especially by the far less extended parietal glaze; but this most important character is often faintly

or not at all expressed in fresh shells, and is usually removed in those which have been "cleaned."

The genotype, *C. dohrni*, lives in rocky stations. It is apparently confined in Florida waters to the rocky area off the Keys known as the Pourtalès Plateau.

"*Voluta*" *gouldiana* Dall, with a unicolored shell or with broad pale bands, is referable without doubt to *Clenchina*, but the dentition is still unknown.

Genus Aurinia H. & A. Adams

Aurinia H. & A. Adams, 1853, monotype *Voluta dubia* Broderip. *Rehderia* Clench, 1945, type *Aurinia schmitti* Bartsch. *Auriniopsis* Clench, 1953, Johnsonia 2: 378, type *Scaphella kieneri* Clench.

Distribution: Southeast Atlantic coast of the United States, Florida and the West Indies.

The shell is spindle-shaped and rather thin. Protoconch subtruncate stump-like or somewhat globose, often with a pointed calcarella. Whorls generally sculptured with fine spiral threads, the spire whorls (which may be shouldered) having axial folds as well. Columellar margin nearly straight or weakly sigmoid. There are two feeble columellar plaits, sometimes not persisting into the adult stage of the shell. Anterior canal long, straight or little recurved, terminating in a shallow notch. There is no siphonal fasciole. The periostracum is extremely thin, not concealing the color pattern of about 6 (5 to 7) spiral rows of brown spots; or (on mud bottom) the periostracum is slightly thicker, dull and opaque, dusky yellow, brownish or olivaceous. The parietal callus is an extremely thin glaze *spreading over much or most of the ventral surface* of the shell. Radula with tricuspid teeth as described on page 2 and fig. 4.

The chief feature differentiating the shell of *Aurinia* from other Scaphellinae is that the thin callus or glaze deposited by the columellar margin of the mantle covers most or all of the ventral face of the shell, covering also such incrustations as may adhere to the periostracum. In *A. georgiana* it may cover most of the apertural side of the last whorl only, as in plate 1, fig. 2, or it may extend on the ventral side over sutures and whorls, to the apex. In the long series seen from off Palm Beach there are all intermediate stages. This condition is obvious in most specimens from muddy bottom, which have the periostracum a little

thicker and darker than those from sandy or rocky bottoms. In the latter such very thin periostracum as may be present is transparent, the flesh colored or pinkish surface with rows of spots showing through; the ventral glaze is extremely thin, or so slight that none is visible, the spots showing through it, and the mantle line on the shell defining it is inconspicuous or no line may be visible.

Most specimens of *Aurinia* in collections have been "cleaned," and the mantle line on the shell defining the ventral glaze is faint or generally obliterated entirely.

The anterior canal is not, or but very slightly, recurved in *Aurinia,* and there is no trace of the convex siphonal fasciole seen in *Scaphella* and usually in *Clenchina.*

Rehderia was based upon specimens with dull, more or less incrusted periostracum, covered by the parietal glaze which had not been "cleaned." The type of *Aurinia* was a specimen with very thin periostracum and imperceptible ventral glaze. Their essential generic identity is demonstrated by the series of dozens of specimens dredged by the McGinty brothers, preserved in their natural condition except for the removal of the sea anemones which were on most specimens. All conchological characters of *Aurinia* and *Rehderia* are exactly the same except for the difference in the surface, which as noted above is fully covered by transitional individuals in "*Rehderia*" *georgiana.* We agree with Dr. Bartsch, who referred the genotype of *Rehderia* to the genus *Aurinia.*

The McGintys report that species of the genus *Aurinia* live in sandy or muddy situations, while members of *Clenchina* live in both rocky or sandy mud localities.

Some confusion has attended the identification of the genotype *Aurinia dubia* Broderip. Originally described and figured by Broderip in 1827, it was based on a shell from an unknown locality. The same figure was copied by Reeve who was not otherwise acquainted with the species. The original figure of *dubia* shows a slender shell about 65 mm. in length, with a rather long, slender, straight anterior canal, and a large bulbous protoconch tipped with a pointed calcarella. There are six rows of well separated brown spots on the body whorl, two rows on the penultimate whorl. The columellar plaits are described as

two in number, "very slightly marked." A photographic copy of Broderip's figure is reproduced in our plate 2, fig. 2. It appears to be a young shell which would add another whorl, the axially costate last whorl shown in Broderip's figure corresponding to the penult whorl of *A. kieneri.* The "two almost imperceptible plaits on the columella" of the immature stage represented by Broderip's type would probably be lost in the fully mature stage, as they are occasionally in *A. georgiana.* In *A. kieneri* the plaits evidently disappear still earlier. The nuclear shell of *A. dubia* is larger than in *A. kieneri* but of the same shape; cf pl. 2, fig. 1a. If this estimate is correct, *Auriniopsis* will fall as a synonym of *Aurinia.*

Genus VOLUTIFUSUS Conrad, 1863

Volutifusus Conrad, 1863, Proc. Acad. Nat. Sci. Phila. for 1862, p. 563.

Bathyaurinia Clench & Aguayo, 1940, Mem. Soc. Cubana de Hist. Nat. 14:92 (Type *Aurinia torrei* Pilsbry).

Type by monotypy: *Fasciolaria mutabilis* Conrad, 1834, Miocene of St. Mary's River, Maryland.

The shell is smooth except for obscure axial riblets and spiral striae on the earliest post-nuclear whorls. It does not have the pattern of spots in spiral series characteristic of most Scaphellinae. The surface is covered by a light glaze of enamel which wholly or mainly obscures the sutures and spreads over the protoconch as well. Anterior canal nearly or quite straight, with siphonal canal notch small; without a siphonal fasciole. Columella plain in the adult, with two small plaits developed in early whorls only, but not emerging to the aperture in the adult stage. Radula as in *Aurinia* but much smaller.

To this genus belong several fossil species often referred to *Aurinia,* from the East Coast Miocene and Pliocene. *Volutifusus* differs from the closely related *Aurinia* by having the surface completely covered by a glaze of enamel from which it may be inferred that the mantle can be extended to envelop the whole shell. In shape of the radular teeth *Volutifusus* (*Bathyaurinia*) is entirely like *Aurinia.*

Bathyaurinia Clench and Aguayo, 1940, differs in no wise from *Volutifusus* in shell characters and is regarded as a synonym.

Volutifusus aguayoi (Clench) from deep water east of St.

Augustine is the only Recent species of this genus known from off Florida.

List of Volutidae of the East Coast, Florida, and westward in the Gulf

Scaphella junonia (Shaw)
Scaphella junonia johnstoneae Clench
Scaphella junonia butleri Clench
Clenchina dohrni (Sowerby)
Clenchina florida (Clench & Aguayo)
Clenchina gouldiana (Dall)
Clenchina robusta (Dall)
Clenchina robusta marionae Pilsbry & Olsson
Aurinia kieneri (Clench)
Aurinia kieneri ethelae Pilsbry & Olsson
Aurinia schmitti Bartsch
Aurinia georgiana (Clench)
Volutifusus aguayoi (Clench)

Notes and descriptions of some Scaphellinae

CLENCHINA ROBUSTA MARIONAE, new subspecies. Pl. 2, figs. 4, 5

The shell is rather shortly fusiform, the diameter contained about 2⅕ to 2⅖ times in the length, moderately solid; dull whitish with squarish dark brown spots in 5 or 6 spiral series. The nucleus has an elevated point, but is eroded in both specimens seen. Postnuclear whorls angular near the middle, the angle closely set with tubercles which are slightly lengthened axially. These tubercles continue over the first half or more of the last whorl; the angle and tubercles disappearing on the latter part of the whorl. Spiral sculpture of low, rounded cords wider than their intervals, about two cords in one millimeter (measured on the last whorl below the shoulder). The cords are smaller and closer above the shoulder and a trifle coarser towards the base. The arcuate outer lip of the aperture is a little more strongly curved in its posterior half. The inner lip is very weakly sigmoid, being slightly concave in the middle and curved towards the left anteriorly; the anterior canal being somewhat recurved, without a distinct siphonal fasciole. There are three low columellar plaits, not visible in front view in the type, but barely emerging in the paratype.

Length 45.3 mm., diameter 20 mm.; length aperture 32 mm. Type.

Length 59 mm., diameter 24.3 mm.; length aperture 40.5 mm. Paratype.

"Gulf of Mexico." Type 189920 ANSP., paratype in Charles R. Locklin's collection.

The special feature of this subspecies is the spiral sculpture which is far coarser than in any of the otherwise similar species. The anterior canal is distinctly recurved. The very thin parietal glaze is about as in *C. florida,* (pl. 1, fig. 4), at the widest extending about half way over the ventral side. In the type the squarish spots are somewhat longer axially, but in the paratype they tend to be lengthened spirally.

This subspecies is based upon two specimens, both probably mature, the difference in size thought to be sexual. The spiral striation is decidedly coarser than in *C. florida.* Though apparently adult the shells are much smaller than *C. robusta.* It is named for Marion (Mrs. C. R.) Locklin, formerly Assistant in the department of mollusks, Academy of Natural Sciences of Philadelphia.

Aurinia kieneri (Clench), Plate 2, figs. 1, 1a.

Fusus tessellatus Schubert, Kiener, 1840, Icon. Coquilles Vivantes 5, *Fusus,* p. 39, pl. 29, fig. 1. [Not *F. tessellatus* Schubert & Wagner, 1829.]

Scaphella (*Aurinia*) *kieneri* Clench, 1946, Johnsonia 2: 58, pl. 31, fig. 1 [copied from Kiener, l.c.; not *Auriniopsis kieneri* Clench, 1953].

This species was named by Clench from Kiener's figure and description, no specimens being then known in America. It is now known by specimens from rather deep water in the northeastern Gulf, one from the Locklin collection figured on plate 2, fig. 1. The shell is light pinkish cinnamon (of Ridgway) in color with six rows of squarish spots of vandyke brown, spots of the upper row small and scattered; the anterior end is vandyke brown with blackish streaks. The embryonic shell of slightly over two whorls is globular and runs spirally to an acute point. The penult and nearly two earlier whorls have rounded axial ribs on the lower half or slightly more, but obsolete on the concave upper part. There are widely spaced traces of ribs in the peripheral part of the last whorl. Fine spiral striae are over all post-embryonic whorls. No trace of columellar plaits. The specimen is adult, having several strong wrinkles indicating former peristomes behind the outer lip.

Length 115 mm., diameter 36 mm.; length of aperture 86.5 mm.; 5¾ whorls.

These specimens agree in the main with Kiener's figure, but the aperture is a little narrower and the columellar margin is less strongly sinuous. *The strong ribs of the penult whorl* and the minute spirals of the glossy surface are the same.

In the shell figured as *A. kieneri* in Johnsonia 2: 379, pl. 187 (1953) the absence of ribs on the penult whorl and the straighter columellar margin of aperture and canal indicate that it is not typical *A. kieneri*, but is referable to the following subspecies.

Aurinia kieneri ethelae new subspecies. Pl. 3, figs. 1, 2, 2a.

Shell large, spindle-shaped, thin-walled, of almost paper thickness at the apertural edge, somewhat heavier elsewhere. The body-whorl is large, moderately convex but with its opposite sides in the middle zone appearing a little flattened and parallel; above that the surface slopes inward to form an appressed zone bordering the suture. Base of whorl is contracted rather strongly and produced into a narrow, straight to slightly twisted canal. The specimen has 5 whorls in addition to a small calloused nucleus of about 1 whorl which has an elevated, peaked calcarella. The first postnuclear whorl is quite narrow, the change from the nuclear stage being abrupt. Second and third postnuclear whorls have about 17 narrow, axial riblets across the middle but they fade out towards the suture. On the remaining whorls the ribs rapidly diminish and are wholly lacking on the penultimate and final whorls. Spiral sculpturing is relatively strong except on the body-whorl where the surface is nearly smooth except for the longitudinal lines of growth. The shell has a thin-edged growing lip, nearly straight or but slightly sinuous in the middle; but about a quarter turn back the growth lines are bunched together and heavier, indicating halts in shell growth.

Length 182 mm., greater diameter near upper end of aperture 54.5 mm.; height of spire above end of aperture 57 mm.

The contracted animal in formalin has a length along the foot of about 70 mm., of a dirty cream color smudged irregularly with black. Tentacles broad, triangular, flat, with a small protuberance on each side at the outer base, probably bearing small eyes. Buccal mass is a large, sausage-shaped, thick-walled organ. The radula is relatively long and very slender, approximately 12 mm. in length, width of teeth about 0.28 mm., the individual teeth closely similar to those of other *Aurinia*, each with three cusps, the mesocone largest, widest in the middle, side cusps long.

Off South Pass, Mississippi River in 220 fathoms. Coll. by Mr. Thomas Dow. Holotype in the private collection of Mrs. Ethel L. Townsend, Coconut Grove, Florida.

We have seen a number of specimens, the type in the collection of Mrs. Townsend being the largest, our illustrations being a few mm. less than actual size. It differs from *A. kieneri* by the far less developed axial ribbing of the spire which is restricted to one or two early whorls, and totally absent on the last two or three whorls. In the specimens of *A. kieneri* seen, and in that figured by Kiener, the costation is strongest on the penult whorl. It remains to be seen whether *ethelae* is specifically distinct from *A. kieneri* when longer series of both become available. For the present, in view of the variability we have observed in some other species of *Aurinia,* we leave it as a subspecies.

No parietal glaze is usually visible on the ventral side of this form, but in one specimen (pl. 2, figs. 3, 3a) given by Mr. C. R. Locklin the surface had gathered a thin coat of diatoms or other marine deposit over which the mantle has laid a glaze covering the ventral side, exactly as described for "*Rehderia.*" This is another illustration of our contention that *Aurinia* species may either occur clean, or incrusted individuals may have a glaze deposited over the incrustation. As this gives the shell quite a different appearance we give here a description of such an incrusted specimen.

Plate 2, figs. 3, 3a. The fusiform shell is long and slender, the diameter one-third of the length or less; not very thick. The nuclear $1\frac{1}{3}$ smooth whorls taper spirally to a high point, as in *A. kieneri.* First postnuclear whorl is axially ribbed with spiral threads, the ribbing becoming weaker and irregular on the following whorl, the last $2\frac{1}{2}$ whorls smooth except for fine growth striae. The whole ventral face of the last two whorls is covered with a white glaze, also covering the suture. The color, visible on the back and spire, is pinkish buff with two rows of russet squarish spots on whorls of the spire, four rows (with traces of a fifth) on the last whorl. The spots are rather small (3 mm. long more or less) on the last whorl, the rows widely spaced. The aperture is flesh tinted within, showing the spots faintly, widest at the anterior third. The outer lip is strongly curved forward in the middle, as usual, retracted to the suture. Columellar margin is very weakly concave in the middle, without plaits.

Length 128 mm., diameter 39 mm.; length of aperture 86.5 mm.; 5¼ whorls.

The shape and color-pattern, as well as the less extensive glaze, differentiate this form from *Volutifusus*.

Aurinia schmitti Bartsch. Pl. 1, fig. 1.

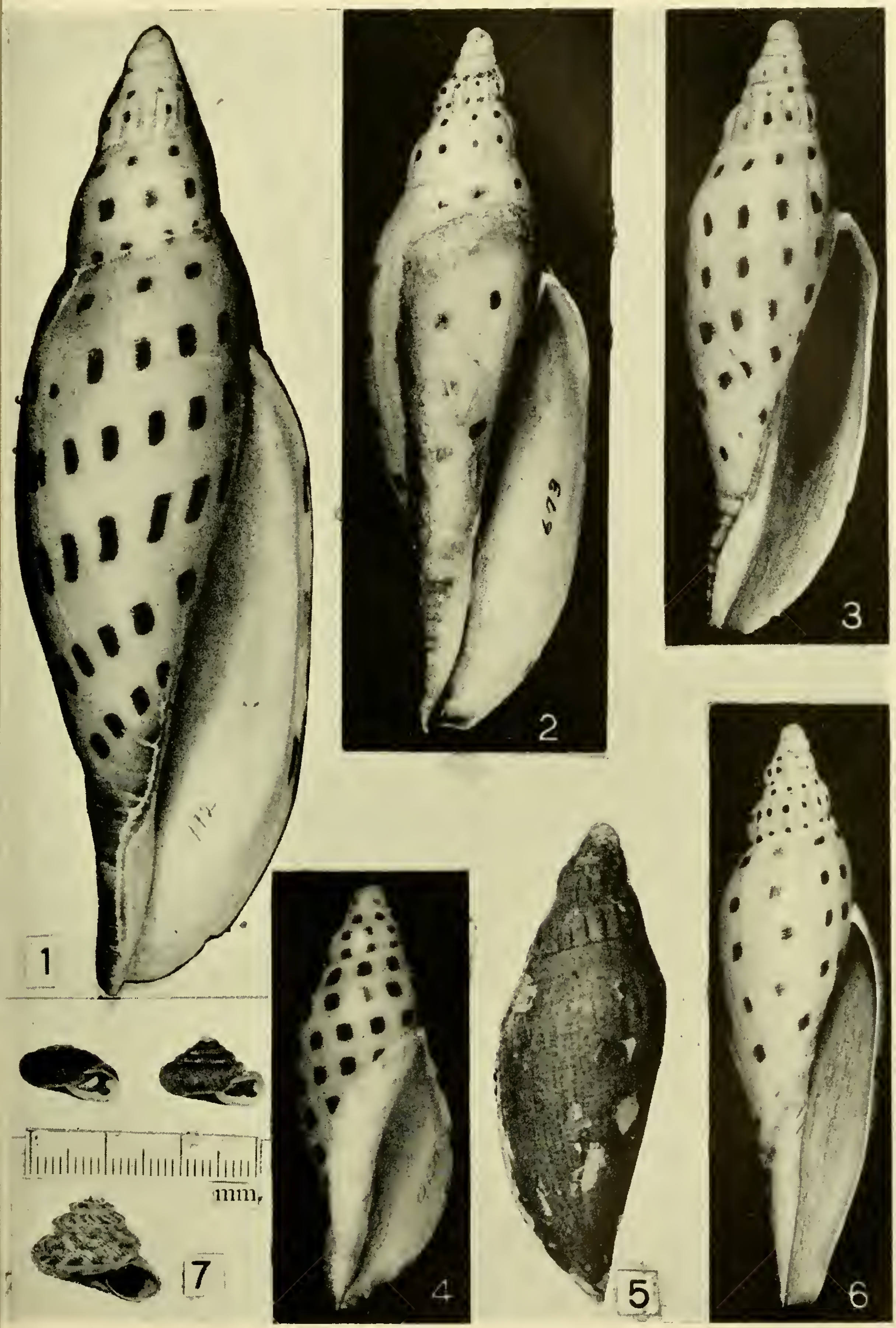
A specimen in the McGinty collection is figured to show the appearance when found clean. The last whorl is more evenly convex and less shouldered than the type figures of *A. schmitti,* but that type specimen is a little abnormal from an interruption of growth in the sutural region near the aperture. There are six spiral rows of squarish spots, those of the upper row small, the rest larger and separated by spaces usually less than twice the size of the spots. The aperture is widened at its anterior third, and about 69 percent of the total length. The columellar margin is nearly straight, and in an oblique view shows two very low but wide columellar plaits. In another specimen the plaits emerge more, being visible in a front view.

Length 130 mm., diameter 41 mm.; length of aperture 89.4 mm.

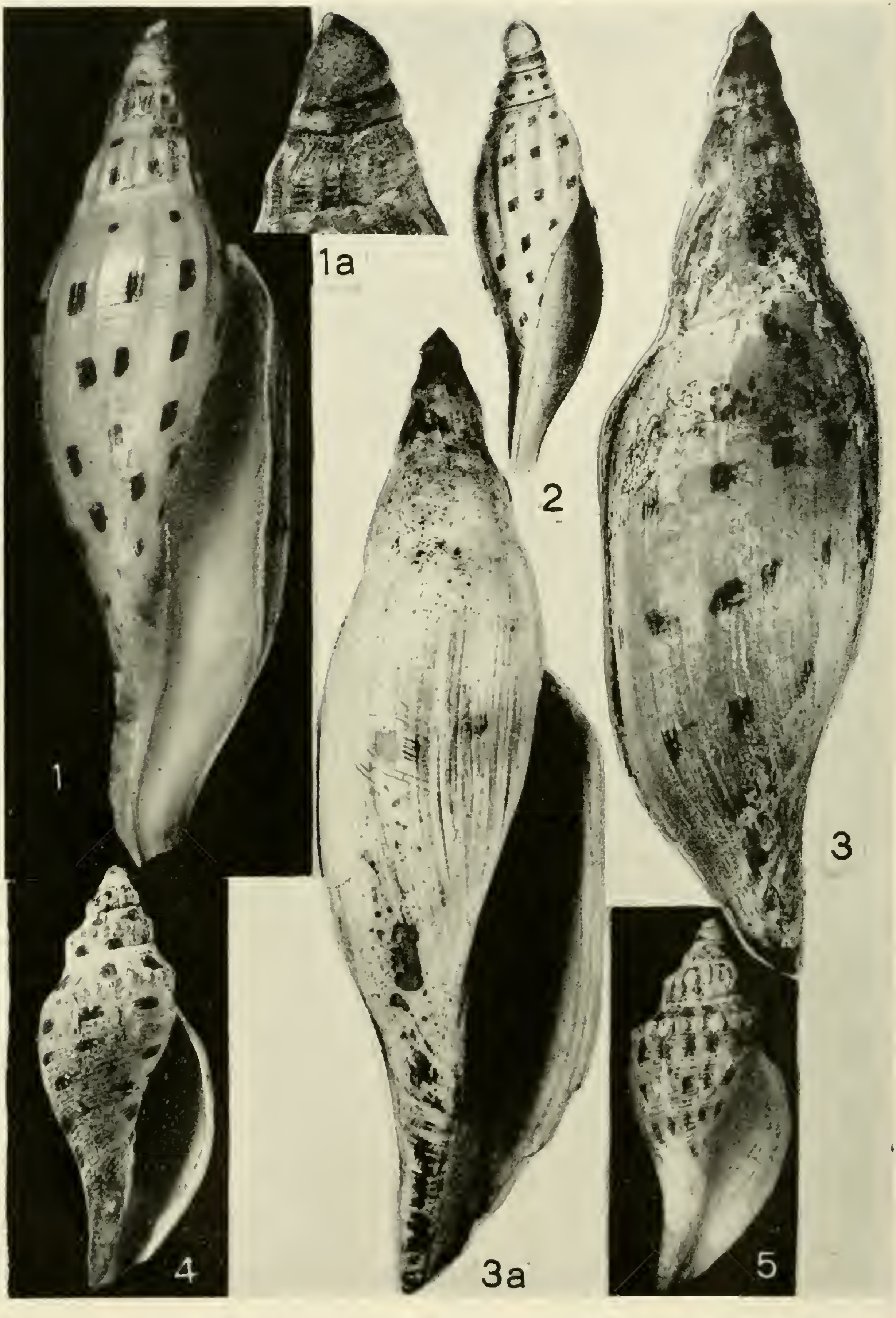
This specimen is from *Triton* Station 992, 165° off Sombrero Key Light in 60 fms., gray mud. It was taken July 21, 1952.

Aurinia georgiana (Clench). Pl. 2, figs. 2 to 6.

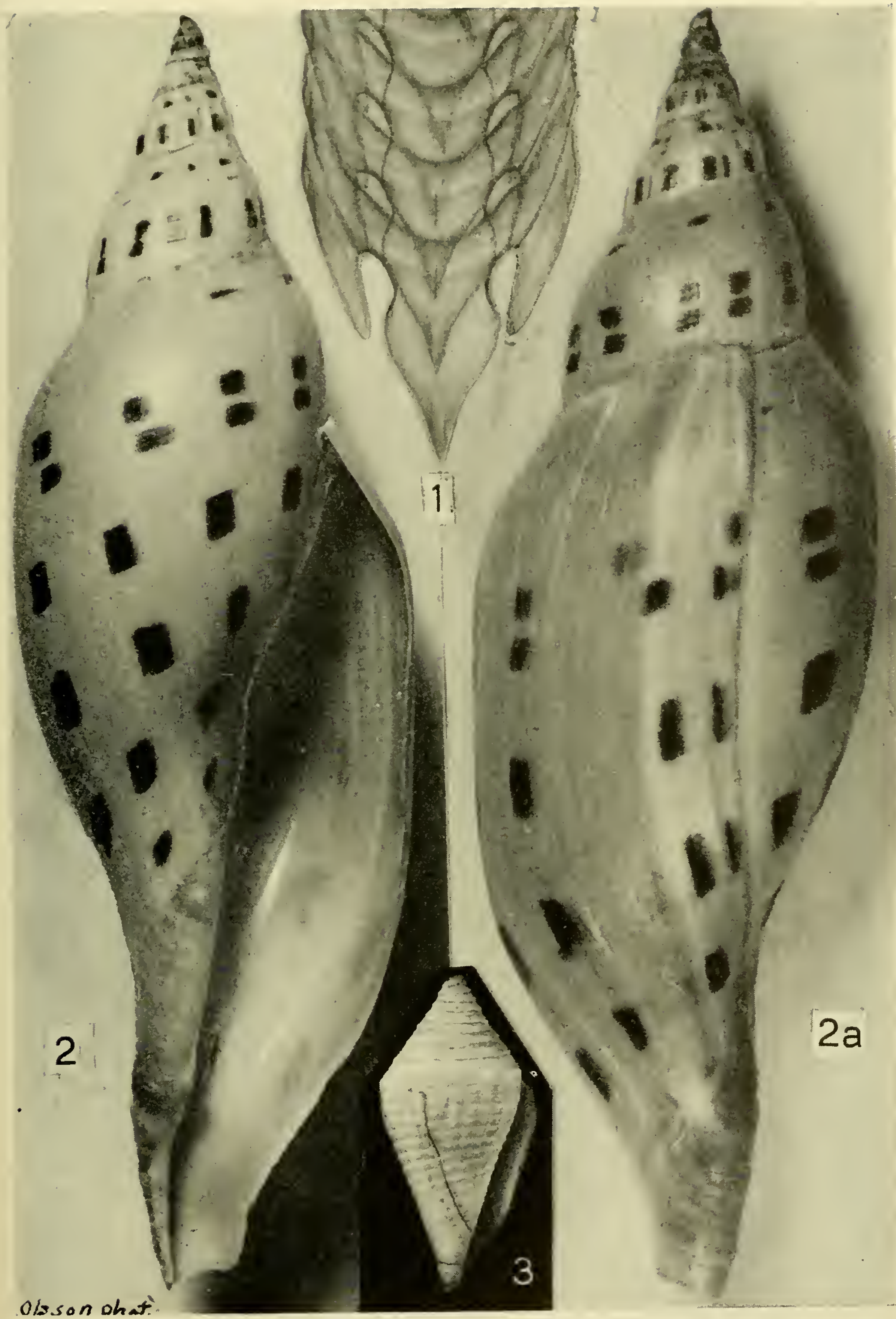
Aurinia georgiana on muddy bottom off Palm Beach in about 75 to 90 fathoms is one of the usual perches for sea anemones. Sometimes several of them occupy the whole surface leaving only the aperture free. Even this may sometimes be contracted by encroachment of this old man of the sea. Other specimens, especially those from sandy bottom, may come up entirely clean, as in pl. 1, figs. 3, 6. The extension of the parietal glaze over the periostracum, as emphasized by Clench in his account of *Rehderia,* is not an unusual condition in shells with thin periostracum, in which, as in many land shells, the glaze is laid on over the periostracum. On muddy bottoms many Aurinias acquire a coating of lime, often with diatoms and other growths. Over this the columellar margin of the mantle deposits a glaze, so that a smooth surface rests upon the extended animal. The back of a coated specimen is shown in pl. 1, fig. 5. See also pl. 2, figs. 3, 3a.



1, *Aurinia schmitti.* 2, 3, 5, 6, *A. georgiana.* 4, *Clenchina dohrni.* 7, *Triodopsis fraudulinta vulgata* (above), *Anguispira alternata* (below).



1, 1a, *Aurinia kieneri.* 2, *Aurinia dubia*, after Broderip. 3, 3a, *Aurinia k. ethelae*, var. 4, 5, *Clenchina robusta marionae.*



1, 2, 2a, *Aurinia kieneri ethelae.* 3, *Conus austini* Rehder & Abbott.

Mollusks from Kwajalein Atoll, Marshall Islands.

A. georgiana shows great variation in shape of the anterior canal end of the aperture, as in pl. 1, figs. 3 and 6. They would hardly be thought the same species if they were not fully connected by intermediate specimens taken on the same bottoms. The anterior canal may be noticeably recurved and rather broad, as in fig. 3, or in a small minority of specimens it may be straight and slender, as in fig. 6. The two small columellar plaits may be barely visible in a direct front view, figs. 2 and 6, or they may be so deeply immersed that they are not visible in the aperture in any view.

Fig. 2 represents a specimen of about maximum size for the species, length 94 mm., width 31 mm.; length aperture 63 mm.; fully 5 whorls. All specimens figured (pl. 1, figs. 2, 3, 5, 6). are from off Palm Beach, 75 to about 90 fms. taken by the *Triton*. There it is the only species of *Aurinia* found in its area.

MOLLUSKS FROM KWAJALEIN

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AND

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The mollusks listed here were collected on the Kwajalein Atoll by R. V. Dietrich while he was on duty with the U.S.A.A.F. during World War II. They have been classified by P. A. Morris of Peabody Museum of Natural History, New Haven, Connecticut, where the collection now is filed.

Kwajalein Atoll, sometimes referred to as Menschikov Atoll, is in the Marshall Island group. The Atoll lies between 8° 40′ and 9° 25′ North latitude and between 166° 45′ and 167° 50′ East longitude (fig. 1).

All shells in this collection were collected from the area around Ebeye, Ennylabegan, Enubuj, Gea, and Kwajalein Islands which are located in the southern part of the atoll. *Cypraea* (*Ponda*) *ventriculus* Lamarck, *Peribolus* (*Arabica*) *histrio* Gmelin, *Erosaria* (*Ravitrona*) *caputserpentis* Linné, *Turbo argyrostomus*

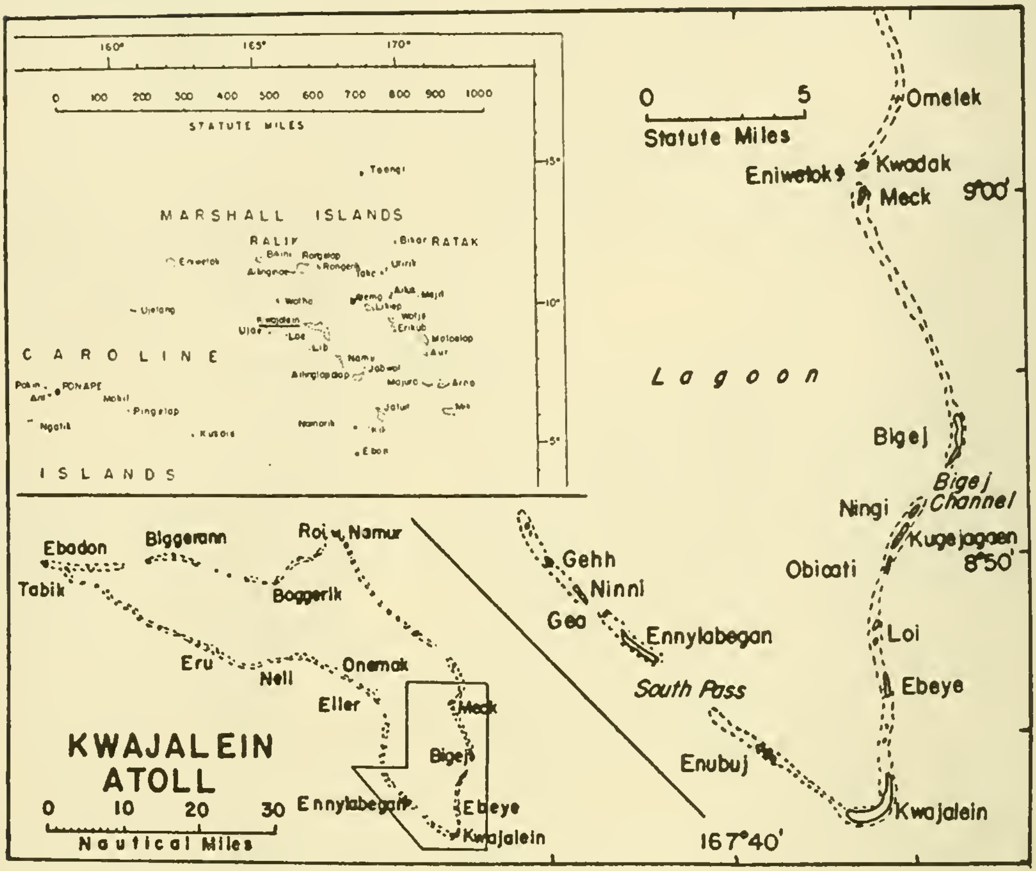

FIG. 1. Index map showing location of area from which this collection came.

Linné, *Lambis chiragra* Linné, and *Haliotis varia* Linné were found alive on the ocean-side reef of Kwajalein Island; *Strombus gibberulus* Linné, *Cerithium fasciatum* Bruguière, *Rhinoclavis sinensis* Gmelin, and *Isognomon perna* Linné were found alive on the reef between Kwajalein and Enubuj Islands; *Pinctada vulgaria* Schumacher, *Plicatula philippinarum* Sowerby, *Ostrea chemnitzii* Hanley, *Peribolus* (*Arabica*) *reticulata* Martyn, *Erosaria* (*Ravitrona*) *caputserpentis* Linné, *Monetaria* (*Ornamentaria*) *annulua* Linné, *Erosaria* (*Ravitroma*) *helvolva* Linné, *Erosaria* (*Erosaria*) *pararia* Linné, and *Nerita polita* Linné were found alive on the reef between Ennylabegan and Gea Islands. The shell of *Charonia tritonis* Linné was found on the lagoon side of Ebeye Island. *Monetaria* (*Monetaria*) *moneta* Linné was found alive on all reefs visited. Only the shells of the other mollusks were found; they were procured from dredgings from the lagoon on the north side of Kwajalein Island during the dredging operations of 1945.

List of Mollusks Collected

Pelecypoda

Arca ventricosa Lamarck
Arca krausii Philippi
Barbatia amygdalumtostum Röding
Anadara scapha Meuschen
Pinctada vulgaria Schumacher
Isognomon perna Linné
Ostrea chemnitzii Hanley
Spondylus cruentus ? Lischke
Spondylus ducalis Röding
Plicatula philippinarum Sowerby
Pallium pallium Linné
Chlamys squamosus ? Gmelin*
Comptopecten spiceri Rehder*
Lima cf. *annulata* Lamarck
Volsella philippinarum Hanley
Brachidontes sp.
Tridacna maxima Röding
Hippopus hippopus Linné
Chama aspersa ? Reeve
Chama semipurpurata Lischke
Chama lazarus Linné
Loripinus vesicula Gould
Codakia interrupta Lamarck
Codakia punctata Linné
Fimbria fimbriata Linné
Trapezium oblongum Linné
Trachycardium elongatum Bruguière
Fragum fragum Linné
Lioconcha hieroglyphica Conrad
Periglypta reticulata Linné
Pitar obliquata Wood
Garfrarium pectinatum Linné
Glycydonta marica Linné*
Asaphis deflorata Linné
Tellina perna ? Spengler
Tellinella virgata Linné
Pinguitellina nucella Dall, Bartsch and Rehder*
Scutarcopagia scobinata Linné
Leptomya near *cochlearis* Hinds*
Macoma sp.
Quadrans gargadia Linné*

Note: star (*) indicates species illustrated.

Cephalopoda

Nautilus pompilius Linné

Gastropoda

Patelloidea saccharina Linné
Patella stellaeformis Reeve
Haliotis varia Linné
Trochus pyramis Born
Trochus histrio Reeve
Clanculus atropurpureus Gould
Turbo petholatus Linné
Turbo argyrostomus Linné
Nerita polita Linné
Nerita plicata Linné
Nerita picea Recluz
Nerita albicilla Linné
Natica cf. *violacea* Sowerby*
Cymatium pyrum Linné
Murex sp.
Nassa sertum Bruguière
Drupa morum Röding
Drupa ricinus Linné
Drupa grossularia Röding
Drupa rubusidaeus Röding
Thais (*Thalessa*) *hippocastaneum* Linné
Morula ura Röding
Morula undata Lamarck
Morula granulata Duclos
Morula concatenata Lamarck

Polinices mammilla Linné
Polinices melanostoma Gmelin
Siphonium sp.*
Aletes sp.
Cheilea equestris Linné
Hipponyx conicus Schumacher
Hipponyx barbatus Sowerby
Torinia infundibuliformis Gmelin*
Phillipia cingulum Kiener*
Littorina obesa Sowerby
Cerithium cf. *salebrosum* Sowerby*
Cerithium cf. *echinatum* Lamarck
Cerithium asper Linné
Cerithium columna Sowerby
Cerithium fasciatum Bruguière
Cerithium nodulosum Bruguière
Rhinoclavis sinensis Gmelin*
Rhinoclavis tenuisculptus Sowerby
Strombus dentatus Linné
Strombus mutabilis Swainson*
Strombus fragilis Röding
Strombus gibberulus Linné
Strombus lentiginosus Linné
Strombus variabilis Swainson
Strombus rugosum Sowerby*
Lambis lambis Linné
Lambis chiragra Linné
Terebellum terebellum Linné
Cypraea tigris Linné
Cypraea (Lyncina) lynx Linné
Cypraea (Ponda) carneola Linné
Cypraea (Ponda) ventriculus Lamarck
Cypraea (Mystaponda) vitellus Linné
Erosaria (Erosaria) erosa Linné
Erosaria (Erosaria) pararia Linné
Erosaria (Ravitrona) caputserpentis Linné
Morula elata Blainville
Pyrene flava Bruguière
Columbella turturina Lamarck
Engina mendicaria Linné
Pisa fasciata Deshayes*
Nassarius papillosus Linné
Nassarius graniferus Kien
Nassarius glans Linné
Nassarius concinnus Powis
Pisania ignea Gmelin
Cantharus undosus Linné
Latirus barclayi Reeve
Pristernia incarnata Deshayes
Peristernia caledonica Petit
Peristernia chlorostoma Gray
Vasum turbinellum Linné
Pusia lanta Reeve
Pusia arenosa Lamarck
Pusia crocata Lamarck
Pusia aureolata Swainson
Pusia sp.*
Mitra mitra Linné
Mitra ambigua Swainson
Mitra papilio Link
Mitra stictica Link
Mitra cylindrica Reeve
Mitra acuminata Swainson
Mitra ostergaardi Pilsbry
Mitra microstoma Sowerby
Mitra chrysalis Reeve
Cylindromitra glans Reeve
Cylindromitra crenulata Gmelin
Scabricula cucumerina Lamarck
Scabricula ferruginea Lamarck
Mitrella figula Duclos
Strigatella paupercula Lamarck
Strigatella golischi Dall*
Tiara filaris Linné
Tiara rufescens A. Ads.
Vexillum gruneri Reeve*
Turricula corbicula Sowerby*
Oliva annulata Gmelin
Oliva sericea miniacea Röding
Oliva sandwichensis Pease
Harpa amouretta Röding

Erosaria (*Ravitrona*) *helvola* Linné
Erosaria (*Ravitrona*) *labrolineata* Gaskoin*
Erronea caurica Linné
Luria (*Basilatrona*) *isabella* Linné
Cribraria (*Cribraria*) *cribraria* Linné
Cribraria (*Talostolida*) *teres* Gmelin
Peribolus (*Arabica*) *histrio* Gmelin
Peribolus (*Arabica*) *depressa* Gray
Bistolida (*Bistolida*) *hirundo* Linné
Monetaria (*Monetaria*) *moneta* Linné
Monetaria (*Ornamentaria*) *annulua* Linné
Pustularia globulus Linné
Pustularia bistrinotata Schilder
Nuclearia nucleus Linné
Quimalea pomum Linné
Phalium vibex Linné
Cymatium gemmatum Reeve
Cymatium pileare Linné
Cymatium aquatile Reeve
Cymatium labrosum Wood
Charonia tritonis Linné
Distorsio anus Linné
Bursa cruentata Sowerby
Bursa granularis Röding
Ranularia (*Gutturnium*) *muricina* Röding
Chicoreus sp.*
Clavus auriculiferus Lamarck*
Terebra maculata Linné
Terebra crenulata Linné
Terebra straminea Gray
Terebra striata Quoy and Gaimard
Terebra funiculata Hinds
Terebra sp.*
Conus omaria Hwass
Conus tulipa Linné
Conus glans Hwass
Conus nussatella Linné
Conus praelatus Hwass*
Conus vitulinus Hwass
Conus imperialis Linné
Conus senator Linné
Conus pulicarius Hwass
Conus capitaneus Linné
Conus rattus Hwass
Conus ermineus Born
Conus marmoreus Linné
Conus chaldens Röding*
Conus ebraeus Linné
Conus eburneus Hwass
Conus abbas Hwass
Conus lividus Hwass
Conus miliaris Hwass
Conus miles Linné
Conus fabula Sowerby
Imbricaria conica Schumacher
Imbricaria sp.*
Xenuroturris angulifera Lamarck
Turris sp.*
Solidula glabra Reeve*
Bulla ampulla Linné

Acknowledgments: Edwin H. Bryan, Jr., Curator of Collections, Bernice P. Bishop Museum, Honolulu, Hawaii, prepared the map (fig. 1); Harald A. Rehder, J. P. E. Morrison, and R. T. Abbott of the United States National Museum, Washington, D. C. checked the identifications of the specimens; Carl O. Dunbar, Director of Peabody Museum of Natural History, New Haven, Connecticut encouraged the writers to prepare this data for publication. All this aid is gratefully acknowledged.

PLATE 4

Species from the collection that are unusual or not figured in readily available conchology books.

NOTE.—Unless otherwise indicated, all figures are natural size.

1. *Chlamys squamosus* ? Gmelin, ×2. (Rich yellow)
2. *Comptopecten spiceri* Rehder. (Ivory and pale red)
3. *Pinguitellina nucella* Dall, Bartsch & Rehder, ×2. (Pale yellow)
4. *Quadrans gargadia* Linné. (Pure white)
5. *Glycydonta marica* Linné. (White and rose)
6. *Leptomya* near *cochlearis* Hinds. (Pure white)
7. *Phillipia cingulum* Kiener. (White and yellowish tan)
8. *Solidula glabra* Reeve. (Brown and white)
9. *Strigatella golischi* Dall. (Pale tan)
10. *Turris* sp. (Ivory and chocolate)
11. *Cerithium* cf. *salebrosum* Sowerby. (Grayish)
12. *Siphonium* ?. (Pinkish gray)
13. *Torinia infundibuliformis* Gmelin, ×2. (Orange-red)
14. *Terebra* sp. (Ivory)
15. *Erosaria* (*Ravitrona*) *labrolineata* Gaskoin, ×2. (Cream and red-brown)
16. *Pisa fasciata* Deshayes, ×2. (Red-brown and white)
17. *Pusia* sp. (Orange and white)
18. *Imbricaria* sp. (Cream)
19. *Conus chaldens* Röding. (Chocolate and pink)
20. *Natica* cf. *violacea* Sowerby. (Ivory and yellow-brown)
21. *Chicoreus* sp. (Rusty yellow)
22. *Rhinoclavis sinensis* Gmelin. (Purplish gray)
23. *Conus praelatus* Hwass, ×2. (Tan and white)
24. *Strombus rugosus* Sowerby. (Orange and white)
25. *Turricula corbicula* Sowerby. (Orange and white)
26. *Clàvus auriculiferus* Lamarck. (Orange and white)
27. *Vexillum gruneri* Reeve. (Lavender and white)
28. *Strombus mutabilis* Swainson. (Ivory and chocolate)

SCALARIFORM ANGUISPIRA AND TRIODOPSIS

By ALAN SOLEM

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While a large number of molluscan monstrosities have been reported in the literature, essentially we know little about the extent and causes of deformities. Many monstrosities are obviously caused by repair of damage to the shell, but a number have been reported where no evidence of damage can be detected. The two described below fall into that category.

Daniels (1912) summarized our knowledge of abnormalities in American land mollusks. Most are the result of damage to the shell or are reversals in direction of coiling. However, he does include two reports of seemingly undamaged scalariform

specimens. One specimen of *Oreohelix strigosa depressa* (now UMMZ 127942), and a specimen of *Anguispira alternata* figured by Wheat (1907) (now ANSP). The *Oreohelix* has five whorls and abnormal growth starts with the post-embryonic whorls. No evidence can be detected of any damage to the shell in the area where abnormal growth starts.

In working over the extensive Royal Ontario Museum of Zoology collection of mollusks (now being added to the University of Michigan collection), I found a single scalariform *Anguispira alternata* without data. The specimen has a diameter of 17.8 mm., height of 15.2 mm. with six whorls. The embryonic whorls are normal, but all subsequent growth is abnormal. Once again there is no apparent trace of injury. The specimen is now UMMZ 181323 and is figured on pl. 1, fig. 7 (lower fig.).

A scalariform specimen of *Triodopsis fraudulenta vulgata* was collected October 9, 1952 from a woodlot on Geddes Road, 2.3 mi. east of the University Museums building near Ann Arbor, Michigan. The specimen was dead, but in good condition, with five and five-eighths whorls, 14.8 mm. in diameter, 9.9 mm. high. The parietal tooth was reduced to a low ridge; otherwise the aperture is normal. Again, the nuclear whorls are normal and there is no trace of injury to the shell. The specimen is now UMMZ 181324 and is figured with a normal specimen from the same locality on Pl. 1, fig. 7 (above). I believe this is the first reported scalariform polygyrid snail.

T. van Hyning (1923) reported a scalariform *Hawaiia minuscula alachuana.* "The nucleus and first whorl are normal, then it suddenly becomes scalariform. What caused the whorls to separate is not possible to determine."

Unlike the abnormalities reported by Wetherby (1878), none of the three I examined shows any trace of an injury which would explain the abnormal growth. In all three cases, the nuclear whorls are normal. A study to determine the possible causes of such growth through experimental injuring of young snails might produce interesting results.

References

Daniels, L. E. 1912. Abnormal shells. Nautilus, 26 (4), pp. 38–42, pl. V.

van Hyning, T. 1923. A scalariform specimen of *Zonitoides minusculus alachuanus* Dall. Nautilus, 36 (3), p. 105.

WETHERBY, A. G. 1878. On the deformities of some Tennessee helices. J. of the Cincinnati Soc. of Nat. Hist., Oct. 1878, pp. 1–4.

WHEAT, S. C. 1907. Abnormal shells. Bull. Brooklyn Conch. Club, I (1), pp. 3–4, figs. 4–7.

OREOHELIX IN SAN DIEGO COUNTY, CALIFORNIA

BY JOSHUA L. BAILY, JR.

In the original description of *Oreohelix californica* from San Bernardina County, Berry (1931) states that this is the first record of this genus from the mainland of the state, with the possible exception of a rumor of a single specimen taken on Cuyamaca Mountain. This peak is in San Diego County of which I am a resident, and the possible occurrence of an *Oreohelix* almost in my own back yard induced me to pursue this rumor to its origin.

In reply to my inquiry Dr. Berry stated that the shell had been taken by Charles L. Cass. Accordingly I called on Mr. Cass who obligingly showed me the specimen. That it was correctly identified as an *Oreohelix* I have no doubt. I asked him why he had never named it and published a description of it, and he told me that he had submitted it to the late Junius Henderson for the purpose, but that the latter had advised against this course.

I then called on Mr. Henderson who was living in San Diego at the time. He explained to me that Mr. Cass himself did not know where the specimen was found. I returned to Mr. Cass who related the account of its discovery.

He had been told of a locality on the mountain where *Helminthoglypta cuyamacensis* could be obtained. Accordingly he visited this locality but did not follow the main highway. He took instead a less travelled road farther to the south. On the way, before reaching the foothills, he stopped at what looked like a good collecting ground, and found several specimens of *Helminthoglypta traskii.* Later in the day he succeeded in reaching the locality he had started for, where he obtained specimens of *Helminthoglypta cuyamacensis,* which he put into the same container, as he had only the one with him. On returning home he found no difficulty in separating the two species but there was

one specimen that did not belong to either. He did not recognize this as an *Oreohelix* at the time as he was not familiar with this genus, but thought he had found a deformed *Haplotrema*. There are two species of this genus in San Diego County, both of which live near the coast, and it was natural under the circumstances for him to conclude that he had picked up this specimen at the first locality. Later, when he became acquainted with *Oreohelix* he recognized his find and concluded that it must have been taken at the higher altitude. (*Oreohelix* is characteristic of high altitudes, the name means "mountain snail.")

I communicated this information to both Mr. Henderson and Dr. Berry. The former felt that since Mr. Cass had not recognized the shell as being unusual when he picked it up made it impossible to rule out the possibility that it may have been in the container before he left home, but Dr. Berry produced a letter which he had received from Mr. Cass shortly after the shell was found, in which the latter stated that Mrs. Frank Stephens had found three snail shells with carinated peripheries on the desert near the eastern boundary of San Diego County. I called on Mrs. Stephens, who did not remember having told Mr. Cass any such thing. Together we spent about an hour going through her collection but found nothing. I then consulted Mr. Cass, but he had forgotten having written Dr. Berry about Mrs. Stephens' shells.

About a year ago I met Mr. Cass in the vault of a bank in San Diego. He told me he had come there to put the shell into his safety deposit box for safe keeping. He allowed me to examine it superficially. It appeared to be an *Oreohelix* of the subgenus *Radiocentrum*. I dropped a pretty strong hint that I would like to have it loaned to me for more detailed examination, but he did not rise to the suggestion, and I had to watch him put it away and then lock the box.

Last summer when I was in England, Mr. Cass died. On my return I learned that his house had been sold, his estate closed, and his personal effects distributed. I contacted the executor of his estate, who told me that he had not seen the shell when the safety deposit box was opened. He consulted the inventory made at the time and reported that the shell was not listed in it. He also gave me the name of the purchaser of the shells in Mr. Cass's home, and I wrote her but she replied that nothing answering the description which I gave her was among them.

Mr. Cass's description of the first locality where he collected was very vague, but that of the second was quite exact. It was on the west side of the road between Descanso and Cuyamaca State Park, where the road was concave to the east, and crossed a culvert through which a trickle of water was flowing. There are two localities answering this description, but they are within a few hundred yards of each other, and anything found at either one is likely to be found at the other as well. I have searched both, but did not find *Oreohelix.* I did not even find *Helminthoglypta.*

The geographic distribution of *Oreohelix* is interesting. Its metropolis is in the Rocky Mountains, and one species, now extinct, is found as far east as Iowa (Pilsbry, 1939). It gets as far west as Celilo on the Columbia River. In California there are only two records—one, that of *Oreohelix californica* already mentioned; the other is *Oreohelix avalonensis* found by Hemphill (1911) on Catalina Island, and described a half century ago, and which has not been taken since, although many collectors have searched for it diligently. An *Oreohelix* in San Diego County would be surprising in view of the activity of collectors here in the past, but the distribution of the genus makes it seem not unreasonable to suppose that one may exist here. My object in putting these data on record is to encourage modern explorers to look for it, and I hope that their efforts will meet with success.

Literature cited

Berry, S. S. 1931. Ann. Mag. Nat. Hist., ser. 10, v. 8, p. 115, f. 1, 2.

Hemphill, H. 1911. Trans. San Diego Soc. Nat. Hist., v. 1, p. 104, pl. 4.

Pilsbry, H. A. 1939. Monog. no. 3, Acad. Nat. Sci. Phil., v. 1, p. 413.

THE ZONITIDAE OF PITTSYLVANIA COUNTY, VIRGINIA

By LESLIE HUBRICHT

This paper is the fourth installment on the land snails of Pittsylvania County, Virginia. The first, on the Polygyridae, was published in The Nautilus, vol. 64, no. 1, July, 1950. The

second, on the Limacidae and Philomycidae, was published in vol. 65, no. 1, July, 1951. The third, which treated the remaining families except the Zonitidae, was published in vol. 66, no. 1, July, 1952. The present paper concludes the series.

Euconulus fulvus (Müll.). Found only on the bluffs along the Roanoke River from Smith Mtn. Gorge to northeast of Hurt.

Euconulus chersinus (Say). Generally distributed over the county in upland oak woods.

Euconulus chersinus dentatus (Sterki). Generally distributed over the county, preferring drier situations than the typical subspecies.

Guppya sterkii (Dall). Generally distributed over the county, but not common.

Oxychilus cellarius (Müll.). Found on a cellar wall in Dan ville.

Retinella burringtoni (Pilsbry). Found on the bluffs and in ravines along the Roanoke River from Smith Mtn. Gorge to northeast of Hurt.

Retinella wheatleyi (Bland). Generally distributed over the county, in upland oak woods.

Retinella lewisiana (Clapp). Known only from a single specimen collected under a log in an upland oak woods along US–29, now within the city limits of Danville.

Retinella rhoadsi (Pilsbry). Generally distributed over the county, but not common.

Retinella indentata (Say). Generally distributed over the county.

Retinella cryptomphala solida H. B. Baker. Known from a single specimen collected on Brier Mtn., near Callands.

Mesomphix rugeli oxycoccus (Vanatta). Common in the hills along the Dan and lower Sandy Rivers.

Mesomphix capnodes (W. G. Binney). Common on the bluffs along the Roanoke River from the Smith Mtn. Gorge to northeast of Hurt.

Paravitrea multidentata (Binney). Found only in the Smith Mtn. Gorge, 5 miles north of Sandy Level.

Paravitrea capsella (Gould). Found on the bluffs along the Roanoke River from Smith Mtn. Gorge to northeast of Hurt.

There is considerable variation in the development of the teeth. Some very young shells will be toothless, but most of them have rows of two or three teeth. Most adult shells are toothless but an occasional shell will have teeth.

Hawaiia minuscula (Binney). Found on waste ground in Danville, where it is probably introduced.

Ventridens suppressus (Say). Found in the hills in the northwestern part of the county. Its range extending as far east as Hurt, and as far south as Callands.

Ventridens gularis (Say). Generally distributed over the county, in meadows, clearings and along roadsides.

Ventridens collisella (Pilsbry). Found abundantly on the bluffs along the Roanoke River from Smith Mtn. Gorge to northeast of Hurt.

Ventridens ligerus (Say). Common in the flood plains of the Dan and Roanoke Rivers.

Ventridens intertextus (Binney). Generally distributed but not common, in clearings and along roadsides.

Zonitoides arboreus (Say). Generally distributed and common.

Striatura meridionalis (Pilsbry & Ferriss). Generally distributed over the county along river bluffs and in ravines.

Genus and species unknown. A single shell found on the bluff along the Banister River, 1.5 miles northwest of Riceville.

The shell is translucent, pale yellowish, depressed, a sculpture of fine growth wrinkles appearing under high magnification, the sutures distinctly impressed; umbilicate, the umbilicus 3.35 times in the major diameter of the shell; major diameter 1.3 mm., whorls 3.3. The shell appears to be mature. The general appearance suggests a young of *Helicodiscus singleyanus inermus* H. B. Baker, but it is distinctly smaller for a shell of the same number of whorls, the umbilicus is smaller, and the shell is not so impressed around the umbilicus. It is undoubtedly a new species but I do not care to name it without anatomical material to determine its affinities. So far, attempts to find additional material have been unsuccessful.

FRESH-WATER MUSSELS USED BY ILLINOIAN INDIANS OF THE HOPEWELL CULTURE

By MAX R. MATTESON
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(*Concluded from April number, p. 138*)

By examining the list of different mussels which were taken from the stream by the Indians at that time and recognizing the type of habitat required by each of these, we are able to determine somewhat accurately the nature of the stream as it existed in 500 B.C. It must have flowed in a shallow basin which is still in existence today on either side of its present channel (fig. 1b). The river's width at that time was 30 to 40 feet. The water was relatively low in velocity, clear, and flowed over sand, gravel, and other types of substrata which were favorable for the existence of the former unionid community. Today, the creek flows over a clay substratum fifteen feet below the former river's basin. The floor of the older river-bed is composed chiefly of sand and gravel. It may be postulated that the stream began to destroy its original bed when flooding increased, due to topographical changes brought about by the farming activities carried on by the present inhabitants of Illinois.

It seems evident that if the habitat demands of an animal or, preferably, a group of animals which are living today can be well established, the environment may be described where these animals formerly occurred. This is taking for granted, of course, that the groups are of the same species. Variations which might develop, even to the formation of a new subspecies, might bring about a new habitat demand which would nullify any speculation of past conditions.

It also seems feasible that, within limitations, conditions somewhat removed from the original habitats of animals who formerly occupied the area may be ascertained. An ecological situation existing at any point in a lotic environment is partially the result of factors operating farther up-stream and, more remotely, conditions existing in the surrounding territory, although the latter may be strictly terrestrial in nature. As an illustration, substances may enter a stream by surface drainage and influence the organisms living there for a considerable dis-

tance below its point of entry. In general, the accuracy with which a former situation may be described is indirectly proportional to its distance from the original site at which the animals of known environmental requirements lived.

By means of carbon ^{14} determination, the approximate time when any given animal existed can often be determined. This may be done by testing either the remains of the animal itself or some objects with which it was closely associated. By exploiting all available knowledge concerning its life history, the nature of the former environment may be ascertained. There are many opportunities for further research in this field.

Bibliography

Baker, Frank C. 1928. The fresh-water Mollusca of Wisconsin. Pt. II. Pelecypoda. Bull. Wis. Geol. Nat. Hist. Sur., No. 70: 1–485.

——. 1930. The use of animal life by the mound-building Indians of Illinois., Trans. Ill. Acad. Sci., *22:* 41–64.

——. 1931. Additional notes on animal life associated with the mound-builders of Illinois. Trans. Ill. Acad. Sci., *23:* 231–235.

Ortmann, A. E. 1920. Correlation of shape and station in fresh-water mussels (naiades). Proc. Amer. Phil. Soc., *59:* 269–312.

Ortmann, A. E., and Bryant Walker. 1922. On the nomenclature of certain North American naiades. Occas. Pap. Mus. Zool., Univ. Mich., No. 112: 1–75.

Schalie, Henry van der. 1938. The naiad fauna of the Huron River, in southeastern Michigan. Misc. Pub., No. 40, Mus. Zool., Univ. Mich., 1–83.

THE MOLLUSKS INHABITING SOME TEMPORARY POOLS AND PONDS IN ILLINOIS AND OHIO

By RALPH W. DEXTER

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I. Introduction

Mollusks were collected from temporary pools in Champaign County and a portion of neighboring Vermilion County of East Central Illinois during the spring seasons of 1935–37 as part of

a survey of fresh-water mollusks in that region. Collections were made again from the same pools in April of 1941 and in March of 1945–50 inclusive. Most of the collecting after the first year of field work was carried out while engaged in a survey of the fairy shrimps (Anostraca, Crustacea) in these vernal pools and ponds. During the ten years from 1941–50 a similar survey was made of fairy shrimp populations in temporary bodies of water found in Portage, Summit, and Stark Counties of northeastern Ohio, and again the mollusks inhabiting these pools were collected. In the summer of 1941 and 1949 observations were made on the aestivation of mollusks in the dried-out basins of many of these pools. While these collections were for the most part made rather incidentally in connection with another field study, they are probably representative of the mollusks inhabiting the specialized environment of temporary bodies of water.

Altogether 208 pools and ponds were examined in this study, 23 in Illinois and 185 in Ohio. A total of 137 of these, or 67% of the total, were found to contain mollusks. Undoubtedly a more thorough sampling would have resulted in the collection of specimens from more of the ponds. Some of the pools were examined but once, some a few times, while others were sampled every year for a period of ten years. A few pools were visited several times each season and 21 pools were examined after drying out as well as during the spring season. Two pasture pools were under observation all months of the year for several years. Those pools which contained fairy shrimps were visited more often and sampled more carefully than those which did not contain those sporadic crustaceans. Collecting took place for the most part between the months of February and May inclusive, and in addition the dried pools were examined from June to August. Collections were made with a dip net during the spring and a garden trowel during the summer. Acknowledgment is made to Mr. Richard L. Snyder for assistance in the study of the Stark County pools during the spring of 1950.

The two regions studied are located in the Central Plains in one case and the Allegheny Plateau in the other. Both regions were covered by the late Wisconsin glaciation; both have clay subsoils providing a clay bottom for the ponds. Most of the ponds investigated are natural depressions, which are more

numerous in Ohio than in Illinois because of the rolling topography of the Allegheny Plateau. Both areas receive an average of 37 inches of annual rainfall which is well distributed through the year, but often with a large share of it falling in the spring months.

In all there were 17 species of gastropods collected and three genera of sphaeriids. All the 12 species of aquatic snails are pulmonates belonging to the families Physidae, Lymnaeidae, and Planorbidae. There were three amphibious species, two belonging to the genus *Succinea* and one to *Pomatiopsis*, and two terrestrial slugs of the genus *Deroceras*. Strangely enough, the slugs were often found submerged in the water and frequently so in large numbers. Shells of certain land snails were sometimes found in the water as well as in the dried-out basins. These were probably remnants from terrestrial mollusks living there during the dry seasons. Shells of *Mesodon, Triodopsis, Vertigo, Gastrocopta,* and *Cionella* were thus collected. The great majority of the polygyrid shells were immature. In general, mollusks were not abundant, although in 36 ponds the common species were present in abundance. Eight species of gastropods and all 3 genera of fingernail clams were collected in large numbers from one or more of the pools. Most of the mollusks were collected on or among vegetation. Bodies of water examined ranged from very shallow puddles in which the water did not remain for more than a few weeks to ponds five feet in depth and which contained water during the greater part of the year, but yet are dried out for at least a brief period annually. A few of the deeper ponds are known to have a small amount of water in the center of the basin throughout years of heavy precipitation. These were few in number, however, and they always had a wide, dry margin every summer. Habitats included the following types: temporary pools and ponds found in pastures, field, flood plains, woods; ditches along roadsides and railroad beds; and cattail, sedge, button-bush, willow, and pin oak swamps. About half of the species of mollusks collected were widely distributed among the various types of temporary bodies of water. Field ponds contained the greatest number of species and roadside ditches the least. The deeper ponds did not contain more mollusks than pools of moderate depth

as might be expected. Very shallow pools, however, were seldom inhabited with mollusks.

Identifications were made or verified by the use of keys in Goodrich and van der Schalie (1944) and by comparison with named specimens in the Rush Collection of mollusks at Kent State University. All species found in Ohio had been earlier listed for the state by Sterki (1907), under one name or another, and those found in Illinois had been reported by F. C. Baker (1902).

II. Species Collected

Physa gyrina Say was the most abundant and widely distributed snail found in this study. A total of 65 pools and ponds including all of the habitat types contained this species which seems to be universally distributed in both space and types of aquatic environments of the east central states. It was especially common in field ponds. Its near relative *Aplexa hypnorum* (Linnaeus) was found in only three ponds which were of different types: a pasture, a field, and a woodland pond. In all three cases, however, this species was very common. The most abundant lymnaeid was *Lymnaea obrussa* Say. This was found in 61 pools and ponds especially those in fields and pastures and was the second most abundant and widely distributed gastropod. Like *Physa* it was found in every type of aquatic habitat. *L. columella* Say was collected from 25 stations, *L. palustris* (Müller) was found in 17 of the ponds, and *L. parva* Lea was found in 12 places, all three of these being found in a wide variety of ponds, but most often in those of fields and pastures. *L. caperata* Say was collected from only 2 stations. *Gyraulus parvus* (Say) inhabited 27 ponds of all types whereas *G. hirsutus* (Gould) was found in only 3 places. *Helisoma trivolvis* (Say) was found 13 times, while *Menetus exacuous* (Say) was taken 3 times, once each in a cattail swamp, willow swamp, and flood plain pond. *Planorbula armigera* (Say) was collected from 3 localities and *Pomatiopsis lapidaria* (Say) was collected only twice—the former in pasture and woodland ponds of Ohio whereas the latter, the only operculate snail collected in this study, was found on a flood plain of the Salt Fork River near Homer, Illinois. *Succinea retusa* Lea was collected from 6 ponds and *S. avara* Say was found in 3 places. The slugs provisionally

identified as *Deroceras reticulatum* (Müller) and *D. larve* (Müller) were frequently found in these temporary pools of water. The former species was found in 24 of the stations of a wide variety of habitat and the latter species was found with it 7 times. All 3 genera of the fingernail clams were collected in this survey. *Sphaerium* (probably *S. occidentale* Prime) was recorded from 37 pools and ponds, *Musculium* from 22, and *Pisidium* from 10. Undoubtedly specimens of these bivalves could have been found in a greater number of cases had more care been given to collecting from the bottom sediments of the collecting sites.

III. Molluscan Populations

While the common species collected were found widely distributed and in a great variety of types of pools and ponds, there seem to be certain assemblages more or less characteristic of a certain type of habitat. The following is a synopsis of the species collected in certain selected stations to illustrate the best development of molluscan populations encountered in this field study. A roadside ditch in Stark County was found to contain *Helisoma trivolvis, Physa gyrina,* and a great abundance of *Pisidium* sp., while the ditch of a railroad fill in Portage County yielded the following species—*Physa gyrina, Lymnasa obrussa, L. palustris, L. parva, Gyraulus parvus, Succinea retusa,* and *Pisidium* sp. A field pond in Portage County contained *P. gyrina, A. hypnorum, L. obrussa, L. palustris, G. parvus, D. reticulatum, Sphaerium* sp. and *Musculium* sp. A pasture pool, also in Portage County, had the following assortment: *A. hypnorum, L. obrussa, L. columella, G. parvus,* and *Sphaerium* sp. A pasture pond in Stark County has had the following mollusks: *L. obrussa, L. palustris, G. parvus, D. agreste, D. gracile,* and *Musculium* sp. A sedge pond of Summit county has yielded specimens of *P. gyrina, L. obrussa, L. columella, G. parvus, Sphaerium* sp. and *Musculium* sp. A cattail pond in the same county has had *P. gyrina, L. columella, G. parvus* and *Sphaerium* sp. A grassy swamp pond of Stark County contained *H. trivolvis, L. obrussa, L. palustris, G. parvus, D. agreste, Sphaerium* sp., *Musculium* sp., and *Pisidium* sp. A buttonbush swamp pond in Summit County has had *P. gyrina, L. obrussa, L. columella, G. parvus, D. agreste, Sphaerium* sp. and *Musculium* sp. A similar

swamp in Champaign County, Illinois, has produced specimens of *P. gyrina, H. trivolvis, D. agreste,* and *Musculium* sp. A willow swamp in Portage county has been found to contain *M. exacuous, S. retusa, D. agreste, D. gracile,* and *Musculium* sp. A woodland pond in Portage County contained *P. gyrina, L. obrussa, L. columella, G. parvus, Sphaerium* sp. and *Musculium* sp. Two flood plain ponds of Portage County had the following species in common: *P. gyrina, L. obrussa, L. palustris, G. parvus, Sphaerium* sp., and *Musculium* sp. One, however, had in addition *H. trivolvis* and *D. agreste* whereas the other contained *M. exacuous.* Two flood plains, both in Champaign County, Illinois, had the following species in common: *P. gyrina, L. obrussa, L. columella, P. lapidaria,* but one contained in addition *Succinea avara* while the other one contained *Sphacrium* sp.

IV. Aestivation of Temporary Pond Mollusks

During the summer months when the pools were dry, 21 of them were visited for collection of material and observations on aestivation. A great many empty shells were found scattered over many of the dried-out basins, but only a very few living mollusks were found. For the most part, these were under a matrix of decaying vegetation which formed a protective mat over the ground and afforded a moist microhabitat in which the mollusks could survive. Strandine (1941) reported similar observations. Some were also found among the roots of plants, in moist soil, and a few under logs, boards, and similar debris. In a number of cases the snails were found concentrated in a small pocket in the lowest portion of the basin where they had apparently followed down the water level as it evaporated and were finally left exposed. If all of the water had not evaporated at the time of visitation or if a small amount of water collected from summer rain, the mollusks were concentrated in such a puddle of warm water during its brief existence. Some of the snails found in aestivation, especially *L. palustris,* had formed an epiphragm while others had not. Mozley (1932) earlier reported epiphragm formation by this species living in temporary ponds. In the region of his study (Winnipeg, Manitoba) *L. palustris* is active for only two months of the year.

Sterki (1912), H. B. Baker (1914), F. C. Baker (1919, 1928),

Mozley (1928, 1932), Henderson, (1932), Strandine (1941), Cheatum (1934), van der Schalie (1940), Ingram (1941), Dickinson (1948–49), and Kenk (1949) have all listed mollusks collected from temporary aquatic habitats, including various species mentioned in the present paper. Many of these writers also discussed the subject of aestivation and reported instances of mollusks in temporary pools surviving periods of dryness by burrowing into the bottom sediments and taking advantage of cracks and similar natural recesses which develop in dried mud. H. B. Baker (1914) observed the appearance of large numbers of juvenile specimens of *Lymnaea palustris* and *Aplexa hypnorum* as soon as rain filled the depressions. Since he had found no adults living in the sediments he believed that the eggs were resistant to drying. He found juvenile specimens of *Sphaerium occidentale* surviving within the protecting shells of the dead parents. Kenk (1949) and the present writer also found only juvenile specimens of sphaeriids to survive a period of drought. Mozley (1928) and Henderson (1932), however, have reported finding full-grown snails active in temporary pools on the first day of filling. Cheatum (1934) has discussed both hibernation and aestivation among fresh-water pulmonates and conducted experiments on these phenomena. Precht (1939) also conducted experiments on resistance to desiccation. Ingram (1940) described the survival of a colony of fingernail clams during dry seasons and Kenk (1949) has reported observations and summarized the literature on survival of the Sphaeriidae during periods of drought. H. B. Baker (1914) and Goodrich and van der Schalie (1944) attributed the distribution of mollusks in many temporary pools to birds as carriers of these animals which have become adapted to living in a unique environment.

Literature Cited

Baker, F. C. 1902. The Mollusca of the Chicago area. Part II. Gastropoda. Nat. Hist. Surv. of Chicago Acad. of Sciences Bull. 3 (2) : 131–420.

——. 1919. The ecology of North American Lymnaeidae. Science 49 : 519–521.

——. 1928. The fresh water Mollusca of Wisconsin. Part II. Pelecypoda. Bull. Univ. of Wisconsin. No. 70.

Baker, H. B. 1914. Physiographic and molluscan succession in lake pools. Rept. Mich. Acad. Sci. 16 : 18–45.

CHEATUM, E. P. 1934. Limnological investigations on respiration, annual migratory cycle, and other related phenomena in freshwater pulmonate snails. Trans. Micros. Soc. 53 (4): 348–407.

DICKINSON, JR., J. C. 1948 (1949). An ecological reconnaissance of the biota of some ponds and ditches in northern Florida. Quart. Jour. of Florida Acad. of Sci. 2 (2–3): 1–28.

GOODRICH, CALVIN, AND HENRY VAN DER SCHALIE. 1944. A revision of the Mollusca of Indiana. Amer. Midl. Nat. 32 (2): 257–326.

HENDERSON, J. 1932. Prolonged aestivation of lymnaeids. Nautilus 45: 140.

INGRAM, W. M. 1941. Survival of fresh-water mollusks during periods of dryness. Nautilus 54 (3): 84–87.

KENK, ROMAN. 1949. The animal life of temporary and permanent ponds in southern Michigan. Misc. Pub. Museum of Zoology, Univ. of Mich. No. 71. 66 pp.

MOZLEY, ALAN. 1928. Note on some fresh water Mollusca inhabiting temporary ponds in western Canada. Nautilus 42: 19–20.

——. 1932. A biological study of a temporary pond in western Canada. Amer. Nat. 66 (704): 235–249.

PRECHT, H. 1939. Die Resistenz gegen Austrocknung bei Planorbiden. Zool. Anz. 128 (5/6): 124–135.

STERKI, V. 1907. A preliminary catalogue of the land and fresh-water Mollusca of Ohio. Proc. Ohio State Acad. Sci. 4 (8) special paper no. 12: 367–402.

——. 1912. Fresh water mollusca living out of water. Nautilus 26 (6): 64–65.

STRANDINE, E. J. 1941. Effect of soil moisture and algae on the survival of a pond snail during periods of relative dryness. Nautilus 54 (4): 128–130.

VAN DER SCHALIE, HENRY. 1940. Aestivation of Lymnaea lanceata (Gould). Nautilus 53 (4): 134–135.

A PRELIMINARY SURVEY OF THE LAND MOLLUSKS OF ALACHUA COUNTY, FLORIDA

By EDWARD H. MICHELSON

I. INTRODUCTION

Although the marine mollusks of Florida have been studied in great detail and the fresh-water and land shells of South Florida and the Florida Keys to a considerable extent, relatively

little has been published concerning the terrestrial mollusks of northern and north-central Florida. With the exception of E. G. Vanatta (1920, 1928), few workers have concerned themselves with the fauna of this region.

This survey was undertaken, from June, 1950, to June, 1951, to investigate the biology of the land mollusks of Alachua County. It was centered around a study of their ecology and distribution. During the year, approximately 100 collecting stations covering the various types of vegetational associations were systematically collected. In order to assure equal and adequate coverage of the various associations, all collecting trips were plotted upon a large vegetation map which had been divided into 30 sections based upon ranges and townships.

A total of 40 species were found. Nine additional species and subspecies have been recorded in the literature from this area, but were not collected during the present survey.

In the past fifty years Florida has changed from a virgin, tropical paradise to one of the most exploited pieces of real estate in the United States. Through the years, the natural vegetation has receded before urbanization, until today there is little left of the "wild" tropical beauty that once covered a major portion of the state. It is hoped that some record will be made of the distribution and habits of its land mollusks before they have vanished from the contemporary scene.

II. Description of the Region

Alachua County is located in the north-central portion of the Florida peninsula at latitudes 29° 25′ to 29° 57′ and longitudes 82° 04′ to 82° 39′. It covers an area of 581,760 acres, of which 228,275 acres are in cultivation. The county is characterized by the presence of numerous lakes and streams. It is bordered on the north by the Santa Fe River.

The geology of this region is of some importance in the study of the ecology of land mollusks, in that the basic raw materials for soils are developed from rock strata. In the main, the soils of Florida have been developed from formations consisting of limestones, marls, and marine deposits of sand and clay (Hender-

son, 1939). Underlying the entire state are limestones which are exposed in some limited areas, chiefly the Central Highlands. Most of the limestone deposits are buried beneath more recent depositions of clay, marl, and sand; however, the depth of such cover varies, so that the characteristics of the soil are often directly influenced by the underlying limestones. This is of some importance to the abundance and distribution of terrestrial mollusks, for most are calciphilic to some degree.

Alachua County is a portion of the Central Highlands (Cooke, 1945), which extends from the Georgia state line southward to Glades County, and is enclosed between the St. Mary's and the Withlacoochee Rivers. The topography of the area is of a diverse nature including low hills, swamps, and plains. The soil is of a sandy nature being derived from the Pleistocene terraces, Hawthorne formation, and the Pliocene Citronelle formation. Practically the entire northeastern portion of Alachua County is underlain by the Hawthorne formation which in turn rests upon Ocala Limestone. The higher western portions of the county appear to be underlain by "Alachua Clays" of the Alachua formation, which is unique in that it was not deposited in water, but rather by the compacting of collapsed portions of the Hawthorne formation. The southern part of the county rests primarily on Ocala limestone.

Alachua County lies approximately 180 feet above sea level, which is about average for the Central Highlands. The average annual mean precipitation for the county is 49.36 inches. July usually has the highest precipitation of 7.32 inches while November is the driest month, having 2.04 inches. Half of the precipitation occurs from June to September and is convectional rather than cyclonic.

The average annual temperature for Alachua County, is 80 degrees. The hottest months are July and August, the coolest January and December. Temperatures below 28 degree are unusual and snow is a rarity. The county, however, is not immune to frosts, December 3 and February 26 being the average dates of the first and last killing frosts.

(*To be continued*)

NOTES AND NEWS

Dates of the Nautilus.—Vol. 66, no. 1, pp. 1–36, pls. 1–4, was mailed July 25, 1952. No. 2, pp. 37–72, pl. 5, November 17, 1952. No. 3, pp. 73–108, pls. 6 and 7, Feb. 2, 1953. No. 4, pp. 109–144, i-v, pls. 8–10, June 8, 1953.—H. B. B.

Discus rotundatus (Müller) from New Jersey.—In R. C. Alexander's "Checklist of N. J. land snails" (Nautilus 66, p. 54), this species was not included. I found it living in large colonies (several hundred snails) at two stations, about a quarter mile from each other, at the extreme southeast corner of Millburn Township, Essex County, elevation about 100 feet, on what was formerly known as the Whittingham Estate. The Westline railroad once ran through this area. The soil is gravelly loam with much vegetation. The snails were found alongside a hiking path on the moist, shady sides of large rocks. *Oxychilus cellarium, Zonitoides arboreus, Cionella lubrica* and several species of slugs were found in the same area with *Discus rotundatus.*—Sam D. Freed, Union, N. J.

The Boston Malacological Club.—Meetings were held on the first Tuesday of every month October through May at the Massachusetts Audubon Society Library, 155 Newbury St., Boston, Mass., at 8 P.M. On June 15th, 1952, the Annual Club Outing was held at Half Way Pond in Plymouth Township, Mass. It was the largest and most successful of the recent outings with everyone enjoying the abundant fresh water collecting. At the monthly meetings from October to May, the following communications were given:

Malacology in New England, Miss Ruth D. Turner.

American Conchologists and their Books, Mr. Richard Johnson.

Molluscan Fauna of the Puget Sound Region, Dr. Emery F. Swan.

Shipworms—Enemies of Man, Miss Ruth D. Turner.

Buoy Collecting off the North Carolina and Florida Coasts, Dr. Arthur Merrill.

Mollusks and Parasites, Dr. Wilber Bullock.

The following officers have been elected for 1953–54: President, Mr. Herbert Athearn. Vice President, Mr. Arthur H. Clarke, Jr. Conchological Recorder, Dr. Joseph C. Bequeart. Secretary-Treasurer, Miss Margaret Farrell. Executive Committee, Mr. Arthur Merrill, Mr. Edward H. Michelson.

THE NAUTILUS

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MAGNIPELTA, A NEW GENUS OF ARIONIDAE FROM IDAHO

By H. A. PILSBRY

A single specimen of a slug from 4½ miles south-southeast of Lolo Pass, Idaho, at 4500 ft. elevation, was collected by Dr. and Mrs. R. T. Orr, July 19, 1948. It was submitted by Mr. Allyn G. Smith to the author for determination. What remains of this specimen is No. 32640 Paleo Type Coll., California Academy of Science. Lolo Pass, in the Bitter Root Range, is in a part of the state where very little if any previous collecting of mollusks has been done.

On opening the specimen it was at once apparent that it was a young slug. The genital system was only partially developed, the ducts thread-like and extremely fragile. Moreover, the viscera were partially macerated though the external integument was still in good condition.

I have withheld report on this slug for some years in the hope that other specimens would turn up; but it seems best to direct attention to such a peculiar species, though only an inadequate account can be given at this time, and its systematic place remains unknown. A new genus to be called Magnipelta is indicated, characterized by the structure of mantle and foot described below.

Magnipelta mycophaga, new species. Plate 5, figs. 1, 2, 3.

The slug in alcohol is short, the mantle covering far the greater part of the upper surface. The mantle is free anteriorly for more than one-fourth of its length, smooth, chamois

colored with an irregular black stripe on each side and elsewhere unevenly spotted with black. The quite short respiratory slit is slightly post-median on the right side. Length of mantle 16 mm. The foot is lighter colored than the mantle, spotted with black on the flanks posteriorly. It has an irregular polygonal impressed reticulation. The pedal margin is quite narrow, the pedal grooves meeting above the tail without any trace of a caudal pore. The sole is transversely wrinkled at the sides, the middle third smoother, but it is not distinctly tripartite.

The jaw is thin, with about 16 flat ribs. It resembles closely that of *Zacoleus* (Proc. A. N. S. Phila., 1903, pl. 28, fig. 3).

Fleshy ridges radiate partly spirally from the orifice where the oesophagus enters the long stomach. The intestinal folds are about as in *Zacoleus, Prophysaon* and *Anadenulus* but shorter, corresponding to the shorter body.

The kidney and heart are about as figured for *Hesperarion niger* (Cooper).

The specimen, when found, was feeding on one of the larger fungi, which suggested the species name.

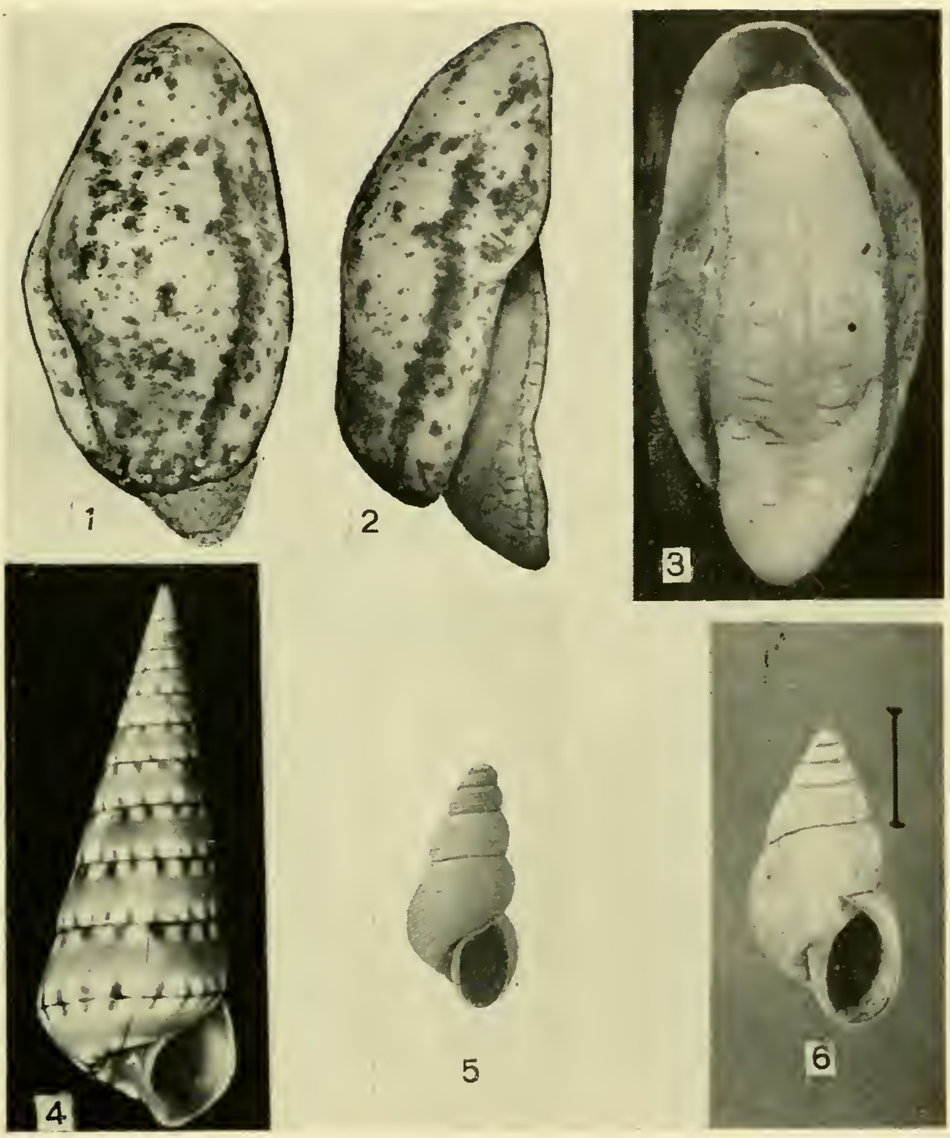
A NEW NISO FROM AMERICAN WATERS

By PAUL BARTSCH

A number of years ago I bestowed the manuscript name *Niso hendersoni* upon a most exquisite member of the genus from off our Gulf and southern coast. The specific name is intended as a little tribute to my friend, John Brooks Henderson, a former regent of the Smithsonian Institution, whose early death interrupted a brilliant career in marine exploration and robbed us of a master in the molluscan field. Mr. Henderson's immense collection rests in the U. S. National Museum, and part of the specimens here listed were dredged by him.

NISO HENDERSONI, n. sp. Pl. 5, fig. 4.

Shell large, very regularly elongate-conic, with flattened polished, shining whorls. The early whorls are decollated in all our specimens. The early remaining turns are yellowish



FIGS. 1, 2, 3, *Magnipelta phycophaga.* Type.

FIG. 4. *Niso hendersoni.* Type.

FIG. 5. *Onoba jacksoni.* Type.

FIG. 6. *Bulimulus novoleonis* × about 2½. Type.

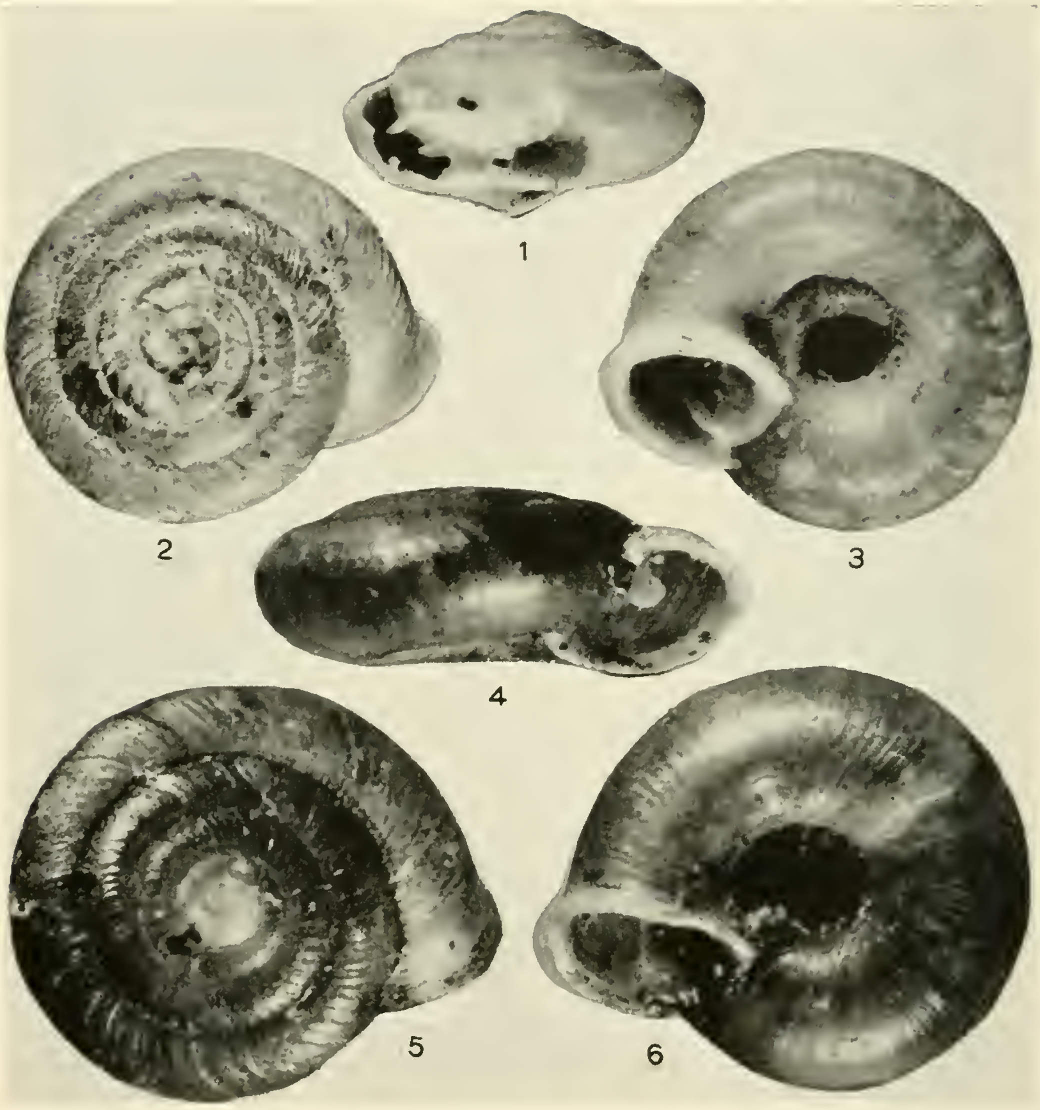


FIG. 1. *Strobilops pilsbryi*, n. sp. Paratype, broken to show internal lamellae (USNM No. 251195).

FIGS. 2, 3. *Strobilops pilsbryi*, n. sp. Holotype, Whitby Cave, Bermuda. (USNM No. 618751).

FIGS. 4, 6. *Strobilops sinaloa*, n. sp. Holotype, from Sinaloa, Mexico. (USNM No. 592719).

All approximately × 15.

white; the later whorls gradually develop a striking color pattern which consists of an uninterrupted slender brown line at the periphery, which is crossed by elongate axial brown spots that extend for about an equal distance upon the whorls and down upon the base. These dark spots are separated by white areas which are two or three times as wide as the dark marks, forming a light spiral zone, which emphasizes the dark markings. Another light spiral zone, about half as wide as the peripheral, is present at the summit, which, like the peripheral zone, is interrupted by brown marks that appear synchronous with those at the periphery. The space between the two light zones has a faint brownish flush. The base is openly umbilicated, the funnel-shaped umbilicus being surrounded by a rather sharp keel, and having a diameter one-third that of the base. The sharp edge of the umbilicus is marked by a slender brown line of about the same width as the dark line at the periphery, and which, like that at the periphery, is crossed by dark and light axial areas that extend upon the base and into the umbilicus. The space between the light sub-peripheral and umbilical zone hase the same brownish tone characterizing the middle portion of the whorls, which is also the color of the interior of the umbilicus. Aperture obliquely oval, outer and inner lip slightly expanded, thin.

The type, U.S.N.M. Cat. No. 93966, was dredged by the U. S. Bureau of Fisheries at station 2402, between the Mississippi Delta and Cedar Keys, in 111 fathoms on mud bottom. It has 15 whorls remaining and measures: length, 27.8 mm.; diameter, 10.3 mm.

U.S.N.M. Cat. No. 43390, a half grown specimen, was dredged by Mr. Henderson in 40 fms. off Fowey Light, Miami, Florida.

U.S.N.M. Cat. No. 433091, a fragment, was dredged in 1913 by Mr. Henderson at *Eolis* station 104, in 50 fms. off Fowey Light.

U.S.N.M. Cat. No. 87268, a fragmented tip, evidently fish-chewed, was dredged by the U. S. Bureau of Fisheries, at station 2619, in 15 fms., on sand bottom off Cape Fear, North Carolina.

This species appears nearest related to *Niso splendidula*

Sowerby [1] which was originally collected by Hugh Cuming at Santa Elena, Colombia. The more elongate, slender shape of the new species will distinguish it from its Pacific coast analogue.

A NEW RISSOID MOLLUSK FROM MARYLAND

By PAUL BARTSCH

In 1924 Mr. Ralph W. Jackson submitted a lot of minute shells to me for identification, upon which I then bestowed the manuscript name *Onoba jacksoni.* Stress of many duties caused me to overlook the publication of the description of the species, a fact which was recently brought to my attention. The species to which I am now giving status appears to have been distributed under this name. Mr. Jackson has been kind enough to send me the material he has collected since his original sending.

ONOBA JACKSONI, new species. Plate 5, fig. 5.

Shell very minute, ovate-conic, thin, semitranslucent, horn colored. The nucleus consists of a little more than one strongly rounded smooth turn forming a blunt apex. The postnuclear whorls are inflated, strongly rounded, marked by microscopic spiral threads, of which 7 are present upon the first turn, 16 upon the next, 20 upon the third, and 26 upon the last whorl. These spiral threads are stronger and more distantly spaced upon the anterior portion of the turns than on the posterior. Periphery strongly rounded. Base with a narrow umbilical chink, marked by microscopic spiral lines like those on the spire. Aperture oval, peristome thin, parietal wall with the merest wash of a callus. The type has 5 whorls and measures: length 2.4 mm.; diameter 1.1 mm.

The type, U.S.N.M. Cat. No. 361662, was collected by Mr. Ralph W. Jackson, at Town Point, on the Little Choptank River, near Dailsville, Dorchester Co., Maryland. U.S.N.M. Cat. No. 361663 contains 80 paratypes from the same source.

[1] *Eulima splendidula* Sby., 1834. Proc. Zool. Soc. London, 1834, p. 6; Conch. Illustr. Eulima, 1834, pl. 53, figure 7.
Niso splendidula Sby., Reeve, 1866. Conch. Iconica, vol. 15, Niso, figure 7.

Paratypes from the type locality are in the collection of the Museum of Comparative Zoology, Harvard University, and in Mr. Jackson's collection. Three further localities are represented in Mr. Jackson's collection: Bolingbroke Creek, Talbot County, and Tedious Creek, Crocheron and Dailsville, 5 miles west of Cambridge, both in Dorchester County. All of these places are on the eastern shore of Chesapeake Bay. In the latter locality the shell was found living on eel grass, which is probably its normal habitat.

From the type of the genus, *Onoba semicostata* (Montagu, 1803), inhabiting European waters, and from *Onoba aculeus* (Gould, 1841), found from Nova Scotia to Long Island Sound, the present species differs in being thinner, smaller, and openly, through narrowly, umbilicate. The aperture is more regularly oval, with the long axis almost vertical and not diagonal, and the columellar margin not flattened; the peristome is thin and not internally thickened, and in one plane, the outer lip not being arched forward. Until the animals of this species are examined, the exact generic position of this species cannot be definitely settled.

THE SCIENTIFIC RÔLE OF THE AMATEUR MALACOLOGIST

By DAVID NICOL

U. S. National Museum [1]

How can the amateur malacologist best serve the field of science that is his hobby? What could be his most valuable contributions? These are questions that many serious amateurs consider. Professional malacologists, because they benefit from the work of the amateurs, should also consider these questions and suggest answers to them.

In my own field of work I am primarily concerned with marine mollusks. I therefore direct my suggestions to amateurs who are interested in the same field of study; but perhaps my

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ideas are equally applicable to those who study land and fresh-water mollusks.

Many amateur malacologists concentrate on taxonomic studies which include mainly faunal lists and descriptions of new genera, species, subspecies, and varieties. In this type of work the amateur is often badly handicapped by the lack of a good library and large collections from many localities. Furthermore, although taxonomic work appears to be relatively easy, it is becoming increasingly complex. New species of mollusks, especially the larger ones, are becoming more difficult to find, and the vast taxonomic literature on mollusks is burdened with countless synonyms and homonyms. In fact, the burden of names has already become too great; as a result, the broader and more comprehensive aspects of the classification of mollusks are being neglected—or drowned in a sea of taxonomic minutiae I suggest, therefore, that amateur malacologists in the future attempt fewer contributions to the taxonomic literature.

This does not mean that the amateur need not study taxonomy. On the contrary, it is essential that the amateur, as well as the professional, strive to classify and document his collections correctly. To know the correct name of a species of mollusk the researcher is working on is absolutely necessary; otherwise the observations have little if any value. Papers that are primarily taxonomic, however, should not be the forte of the amateur. Instead, the amateur can make much more valuable scientific contributions in other fields of malacology.

What is greatly needed is the amateur who treats the mollusk as a living animal, not one who treats it like a stamp and adds a new and rare variety to his collection as his greatest personal satisfaction. Many of the most common mollusks are the most interesting and, furthermore, the most important. To put a premium on uniqueness benefits neither the professional nor the scientifically minded amateur.

Many amateurs have more opportunity to observe the living mollusks than professional malacologists, much of whose time must be devoted to curatorial or teaching activities. Amateurs can make valuable observations on depth and type of bottom where the living mollusk is found, time and mode of spawning, observations on the larvae, how and on what the mollusk feeds,

and the like. Many of these observations can be made with a minimum of equipment. The professional taxonomist and the economic malacologist would be glad to see these observations published. The professional would, furthermore, be eager to assist the amateur in identifications and interpretations.

An example or two of what is needed seems apropos. When I was working on the genus *Echinochama* (Nicol, 1952), I needed some ecological observations, particularly on the type of bottom on which these pelecypods live. I had access to some data on dredged specimens at the U. S. National Museum, but could I be certain that these data were accurate? Perhaps all the specimens had been dead and had been swept into foreign environments by waves and currents long before they were dredged. I wrote to Mr. Tom McGinty and asked him on what type of bottom he found living specimens of *Echinochama.* He replied that *Echinochama* usually lives on a bottom of broken shells. This observation did not jibe with most of the dredging records on specimens at the Museum, but, needless to say, I used Mr. McGinty's observations on living specimens rather than the dredging records on dead ones.

Many observations by amateurs can be of economic importance. What gastropods are carnivorous? What species do they feed on? When do some of the common mollusks spawn and under what conditions? Many of these observations, particularly on the commoner species, are made by malacologists working for the Federal Government or a State government. Many thousands of dollars are spent every year collecting such data, and the amateur could often supply that information by publishing his observations. It is astounding to find what little has been published on even the simplest ecological facts on the most common and commercially important mollusk species.

Many species problems could be solved by field observations made by the amateur malacologist. As a hypothetical case, a common clam lives in a muddy bay; and a very similar form lives in shallow water far out in the Gulf of Mexico. The bay specimens may have a slightly different shape and perhaps differ in other minor details from specimens found in the Gulf of Mexico. Perhaps all that is needed to settle the question as to whether there are one or two species is to observe the time of

spawning of the two forms. An observant amateur can solve the problem as skilfully as any professional.

Thus, the amateur's most valuable contributions to the science of malacology can result from his consideration of mollusks as living animals. Carefully recorded observations, if published, can aid the professional economic malacologist and the professional taxonomist in malacology.

Reference

Nicol, David, 1952. Revision of the pelecypod genus *Echinochama.* Jour. Paleontology, vol. 26, no. 5, pp. 803–817.

LYMNAEA STAGNALIS IN EGYPT

By A. FOUAD ABDEL-GHANI [1]

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Members of the genus *Lymnaea* have a world wide distribution. Although *L. cailliaudi* is the common species found in Egypt, Pallary (1924) listed five species, i.e., *L. cailliaudi, L. acroxa, L. alexandrina, L. truncatula* and *L. raffrayi.* He did not describe *L. stagnalis* or list it for Egypt.

During April of 1953 the author made a preliminary survey of mollusks in Wadi El Natroun, on oasis-like area in western Desert of Egypt, approximately 60 miles northwest of Cairo. The search was made primarily to learn whether *L. cailliaudi* occurred in this area. Specimens of *L. stagnalis* were dipped from the vegetation along the margins of both clear and stagnant pools of water in the wadi. *Planorbis philippii, P. mareoticus* and *Succinea* were also found. The following plants were common in the pools: *Cyperus laevigatus, Typha augustata, Zanichiella palustris,* and *Veronica anagallis.* The first two plants

[1] The author wishes to express appreciation to Dr. A. Ezzat who suggested survey of the Wadi El Natroun area; to Dr. Robert E. Kuntz of NAMRU-3 for assistance in preparation of the manuscript; to Dr. B. Hubendick and Dr. A. Mozley for confirmation of identification of snails and to Dr. I. S. Helmy under whose supervision the work has been done.

are preferred by both snails and grazing animals. The water had a pH of 7.3.

Most of the snails went into aestivation during the 24 hour period between time of collection and return to the laboratory. These readily emerged and became active when placed in aquaria containing tap water and lettuce. During the period of one month 104 *L. stagnalis* deposited approximately 500 egg-masses, varying in length from 13 to 65 mm., and containing from 23 to 180 eggs; polyembryony was common. The measurements of the larger specimens are as follows: overall length or height 50 mm.; maximum breadth 26 mm.; height of spire 25 mm. There are six whorls. Body and shell coloration is typical of that described for the species. Identification of alcoholic specimens has been checked by Dr. B. Hubendick and Dr. Alan Mozley. Both feel that these are typical *Lymnaea stagnalis.*

The finding of *L. stagnalis* at Wadi El Natroun presents an interesting problem in mollusk distribution. It seems strange that the species should occur spontaneously in a desert area where ecological conditions are not the best for survival and where there is no direct means of introduction through rivers or irrigation systems. The area is several meters below sea level and is separated from the Nile Delta by fifteen miles of the wadi desert and sand. Water levels in the wadi fluctuate considerably throughout the year.

Freshwater in which snails were found is limited. Although speculation is none too safe, two facts may be mentioned for possible consideration: Wadi El Natroun lies in the path of migrating birds to and from Africa and Europe. The area is visited yearly by the nomadic Bedouins who travel across North Africa, and to and from the Middle East. The goat skin water bag is always carried and is filled from streams, springs and other bodies of water as the Bedouin moves from one locality to another and serves as a possible means of transfer for aquatic invertebrates.

Reference

Pallary, P., 1924. A la Faune Malacologique Terrestre et Fluviatile de l'Egypte. Mem. l'Institut d'Egypte, Tome 7: 46–49.

LAND MOLLUSKS FROM NUEVO LEON, MEXICO

By H A. PILSBRY

BULIMULUS (RABDOTUS) NOVOLEONIS, new species. Pl. 5, fig. 6.

Mexico, state of Nuevo Leon: Cerro Potosi (near Galeana), at about 10,000 ft. Collected by C. N. Mueller. Type 191020 ANSP.

The narrowly umbilicate oblong-conic shell is rather slender, the length nearly twice the diameter; thin. The dead shell is white. The embryonic shell of about 1½ convex whorls is smooth at first then with regular sculpture of fine but weak axial riblets separated by somewhat wider intervals. The apex is obtuse, with deep sutural dimple. Later whorls are convex and have unevenly spaced riblets and wrinkles. The aperture and peristone are shaped about as in *B. dealbatus.*

Length 12 mm., diameter 6.4 mm., length aperture 5.4 mm.; 5⅓ whorls.

This appears to be a dwarf mountain form of the *B. dealbatus* group.

ERECTIDENS, new genus

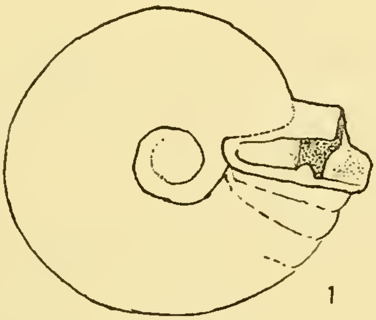
The shell is somewhat similar to *Polygyra,* but differs by its fewer whorls, small size and thin texture, and by the form of the parietal tooth, which is entirely transverse, being a thin, marginal erection of the parietal callus somewhat as in *Stenopylis,* without any such obliquely entering part as is seen in *Polygyra.*

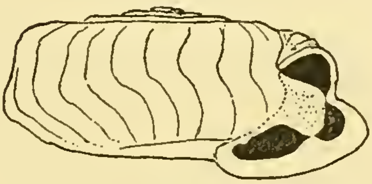
Type *Erectidens trichalus,* n. sp.

That this peculiar little snail is directly related to *Polygyra* appears doubtful. In the only *Polygyra* approaching *Erectidens* in size, *P. pustula* (Fér.), the parietal tooth is not marginal, and has an entirely different structure. The Mexican shell apparently represents a new genus. As it was not collected alive, or seen in the field, its place in the system remains uncertain until living examples are secured.

ERECTIDENS TRICHALUS, n. sp. Figs. 1, 2.

Mexico, state of Nuevo Leon: Drift debris of the Rio Maurisco near its junction with the Rio Carrizo to form the Rio Ramos. Collected by the author, 1934. Type 164748 ANSP.


1


2.

The very thin shell is discoidal with the spire only slightly convex, the periphery bluntly subangular, the base with an open umbilicus which is contained about 3.4 times in the diameter. There are 4½ rather convex whorls, the first one and two-thirds smooth, the rest having thin, widely spaced radial ribs, about 26 on the last whorl. The last whorl has a weakly concave zone in the middle of its height, above and below which it is convex. The base is somewhat convex. The aperture is trilobed; the peristome thin, continuous, the outer lip expanded, two lobed, with a short tooth within near its lower end. Basal margin is straightened, narrowly reflected, thickened within, with a tooth at about the outer third of its length. The parietal margin is thin, rising into a high squarish lamellar tooth opposite the contraction of the outer lip.

Height 1.65 mm., diameter 3.35 mm.

The single specimen was found in a small quantity of flood debris, taken home for examination as it was seen to contain shells, chiefly *Pupillidae*. The Rio Maurisco is a short stream on the eastern slope of the Sierra Madre Oriental, about 25 kilom. south of Monterrey.

The widely spaced, slender riblets and the concavity around the peripheral curve of the last whorl are not seen in any other snail known from Mexico or the United States. No color remained in the dead specimen.

A PRELIMINARY SURVEY OF THE LAND MOLLUSKS OF ALACHUA COUNTY, FLORIDA

(*Concluded from July Issue*)

By EDWARD H. NICHELSON

III. Description of Vegetational Communities

The vegetational communities studied during this survey will be briefly described; a more thorough description may be obtained from Laessle's (1942) paper on the area.

Scrub Communities: Scrubs are usually well drained, sandy areas dominated by sand-pine (*Pinus clausa*); however, the drainage in such communities may be no better than High Pine communities. The topography is of the rolling type and the lack of a hard pan accounts for the excessive drainage in such areas. Herbaceous vegetation in exceedingly sparse and considerable areas of white sand are characteristic. The apparent lack of herbaceous vegetation, more than likely, accounts for the infrequency of ground fires. The vegetation that does occur is usually 6 to 8 feet in height with variations caused largely by the length of the intervals between fires. Typical vegetation of this area includes sand pine (*Pinus clausa*), scrub oak (*Quercus myrtifolia*), live oak (*Q. virginiana*), saw palmetto (*Serenoa repens*), and rosemary (*Ceratiola ericoides*). The type of major habitat indicated by the scrub community is limited in this county and occurs only in a small area around Newman's Lake.

High Pine-Turkey Oak Communities: This community is sometimes more xeric than the scrub. Like the scrub there are areas which are bare of vegetation and lighted by the sun. In this community, as in the scrub, fire is an important factor and the relative proportion of pine to oak is determined by the frequency of fires. The pine, being less susceptible, is usually the dominant plant. This community may exist predominantly as pine, as oak, or as a mixture of the two. The characteristic vegetation includes the long-leaf pine (*Pinus palustris*), which at times is dominant, turkey oak (*Quercus laevis*), and wire grasses. Red oak (*Q. falcata*) may be present.

Hammock Communities: Hammock communities have been

defined by Laessle (loc. cit.) as woods dominated by broadleaved evergreen trees, never flooded but well drained or saturated. The hammock communities of Alachua County are divided into three types: xeric, mesic, and hydric.

(a) The xeric hammocks are characterized by being rather open, with live oak, the dominant species, scattered irregularly throughout. Other characteristic species are blue-jack oak (*Q. cinerea*), laurel oak (*Q. laurifolia*), and cabbage palms (*Sabel palmetto*). The soil is well drained and with the heavy transpiration of the larger trees accounts for the xeric conditions.

(b) The mesic hammocks contain richer soils than do the xeric hammocks and show a greater water holding capacity. This is due to the accumulation of organic matter. Laessle considers the climax condition of this type of hammock to be a *Magnolia-Ilex* hammock. Laurel oak, live oak, water oak (*Q. nigra*), and sweet gum (*Liquidambar styraciflua*) are frequently present. The vegetation of mesic hammocks is more dense than that of the xeric hammocks, allowing little sunshine to fall on the forest floor. Fire is not too frequent in this community, but when it does occur, it may cause a regression to the scrub or turkey oak community.

(c) The hydric hammocks, oftentimes referred to as low-hammocks, have soils which are poorly drained though never flooded. The high saturation evidently places a check on fires and they rarely occur in such localities. The arboreal plants characteristic of such communities consist of sweet gum, red bay (*Persea borbonia*), Florida elm (*Ulmus floridana*), cabbage palm, and wax myrtle (*Myrica cerifera*).

Flatwood Communities: The flatwoods are characterized by poorly drained flat land, normally dominated by either *Pinus palustris* or *Pinus Elliotti,* soils of high pH, and rather abundant herbaceous ground cover in the absence of fire. It is, however, the general practice in this area of Florida to burn over the flatwoods periodically to provide improved grazing land. The two types of flatwood communities investigated were the long-leaf pine and slash pine communities. The long-leaf pine and sabal palmetto being prevalent in the first, while slash pine, gallberry (*Ilex glabra*), and wax myrtle are in abundance in the latter.

The slash pine communities frequently lie between the long-leaf Pine flatwoods and low elevations.

Ruderal Communities: This term is applied to those areas whose natural flora has been disturbed by man. It is a broad definition and includes arable fields, roadsides, lawns, orchards, and other such areas. In addition to the previously designated communities, two additional areas have been investigated. These are dry prairie, occurring only at one location, and limestone sinks, which are numerous throughout the county.

IV. Frequency of Occurrence

The regularity with which a given molluscan species is found to occur in a given type of habitat may be called its frequency of occurrence. In Table I an attempt is made to present a unified picture of the frequency of species in the vegetational habitats of Alachua County. To accomplish this purpose, six categories have been selected: hammock communities, scrub communities, pine flatwoods, high-pine turkey-oak communities, limestone sinks and outcroppings, and ruderal communities. The symbols "C", "F", "O", and "R", are used to represent common, frequent, occasional, and rare occurrence. Common species are those found more than 75 percent of the time in a given type of habitat. Frequent species are present from 50 to 74 percent of the time. Species found 25 to 49 percent of the time are occasional, while those collected less than 25 percent but more than 1 percent of the time are considered rare. No symbol is used for species found less than 1 percent of the time, but these are included in Table I to indicate their occurrence in the county.

In addition to those species found in Table I, several other species are recorded in the literature as occurring in Alachua County which were not found in the present survey. *Ventridens ligera* has been reported by Van Hyning (fide Pilsbry, 1946). Pilsbry believes that it was introduced, and in view of the lack of records from elsewhere in Florida, this seems to be substantiated. Vanatta (1923) reports the presence of *Carychium exile* and *Helicina orbiculata* at two localities—Buzzards Roost and the Devils Mill Hopper. Examination of both locations has

failed to produce a single specimen of either species. Both areas have undergone great phytographic changes in the past twenty years, and it is likely that these species have been exterminated as a result. With respect to *Carychium exile* it is more plausible, however, to assume that Vanatta confused this species with *Carychium floridanum,* for there is no other record of the former

Table I. Frequency of occurrence of Molluscan species in the habitats of Alachua County

Species	Hammock Associations	Scrub	High-Pine Turkey Oak	Sinks and Outcrops	Cultivated	Roadsides
Polygyra pustula	C			C	O	O
Polygyra auriculata	O		R		F	O
Polygyra avara	C				F	
Polygyra septemvolva						
Polygyra septemvolva volvoxis					R	
Praticolella jejuna			O			
Triodopsis hopetonensis			R			
Triodopsis vannostrandi goniosoma						
Euglandina rosea	C	R	O	O	O	
Drymaeus dormani	C				C	
Deroceras laeve	O				O	
Euconulus chersinus	O					
Guppya gundlachi	R			R		
Retinella indentata paucilirata	F			O		R
Retinella dalliana	F		R	C		R
Mesomphis vulgatus	O					
Hawaiia minuscula	C				O	
Ventridens cerinoideus	C				R	
Zonitoides arboreus	C			O	R	
Striatura meridionalis				O		
Gastrocopta pentodon	O			O		
Gastrocopta corticaria				R		
Gastrocopta rupicola	O					
Gastrocopta armifera	R			R		
Gastrocopta tappaniana	O			O		
Gastrocopta contracta				O		
Vertigo milium	F			O		
Vertigo ovata	F			O		
Vertigo oscariana						
Pupisoma minus	O			O		
Pupisoma dioscoricola				O		
Carychium floridanum				O		
Philomycus carolinianus	C			O		
Helicodiscus parallelus	O			O	O	
Strobilops texasiana	F	R		O		O
Strobilops aenea	F	O		O		
Strobilops hubbardi		R				
Succinea unicolor				O	R	
Succinea concordialis				R		
Oxyloma effusa					R	

species occurring anywhere on the Florida peninsula. *Striatura milium* has also been reported by Vanatta. In view of the present distribution of this species, West Virginia and Kentucky being the southern limits so far as I can determine, it is very likely that Vanatta's specimens may have been *Striatura meridionalis.*

Two races of *Hawaiia minuscula* have been reported by Pilsbry as occurring in this county, *Hawaiia minuscula minuscula* and *Hawaiia minuscula alachuana.* The race *alachuana* was described by Dall upon the shape of the umbilicus, which is dilated, as compared to *minuscula,* which has a thimble-shaped umbilicus. The majority of the specimens collected during this survey had a thimble-shaped umbilicus; however, there were transitions between the two shapes and a few specimens might be considered as having a dilated umbilicus. The specimens collected in the survey, in themselves, do not present a picture of two well defined races.

Guppya sterkii, Retinella cryptomphala solida, Helicodiscus singleyanus inermis, and *Punctum minutissimum* have also been recorded as coming from this county (Pilsbry, 1946, 1948).

In view of the data obtained thus far, apparently the environments of the hammock associations and the limestone sinks and outcroppings provide a suitable habitat for land mollusks. Likewise, the environments of the pine flatwoods (omitted from the table, as only two species, *Praticolella jejuna,* frequent, and *Englandina rosea,* rare, were found) and scrub localities are least suitable.

Literature Cited

Cooke, C. Wythe. 1945. Geology of Florida. Florida Geological Survey, Geol. Bull. 29: 1–339.

Henderson, J. R. 1939. The soils of Florida. Univ. Florida Agric. Exp. Sta. Bull. 334: 3–67.

Laessle, Albert M. 1942. The plant communities of the Welaka area with special reference to correlations between soils and vegetational succession. Univ. Fla. Pub., Biol. Sci. Ser. 4 (1) : 1–143.

Pilsbry, H. A. 1946. Land mollusca of North America (North of Mexico). Acad. Nat. Sci. Philad. 2 (1) : 1–520.

——. 1948. Land mollusca of North America (north of Mexico). Acad. Nat. Sci. Philad. 2 (2) : 52–1113.

Vanatta, E. G. 1920. Shells of Orlando, Florida. Nautilus 34: 31.

——. 1928. Land shells of Alachua County, Northeastern Florida. Nautilus 42: 20–21.

TWO NEW AMERICAN SPECIES OF STROBILOPS

By J. P. E. Morrison [1]

For the second time, after an interval of ten years, the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture submitted specimens of the Pulmonate genus *Strobilops* from western Mexico, to the United States National Museum for determination. A critical check of these shells of the subgenus *Discostrobilops* with all related material in the collections of the United States National Museum and of the Academy of Natural Sciences of Philadelphia, has shown that they belong to a hitherto undescribed species, coming from a geographic region in which the genus has not previously been recorded.

In the course of this brief study it was discovered that this genus also includes a species endemic to the Bermudas, which has been hitherto unnamed. The description of the two new species follows:

Strobilops pilsbryi, new species. Plate 6, figs. 1–3.

1904 *Strobilops hubbardi* Gulick, Proc. A.N.S.P., 1904: 413.
1904 *Strobilops hubbardi* Verrill, Trans. Conn. Acad. Sci., 12: 168: fig. 53. . .
1927 *Strobilops hubbardi vendryesiana* Pilsbry (partim), Man. Conch., 28: 49: 7: 10–12.

Gulick in 1904 remarked on the larger size of the adult he saw from locality 806 (fossil in Bermuda). He gives the size as altitude 1.2 diameter 2.8 mm. Pilsbry (1927) described the Bermuda form as "larger, with the lip somewhat more thickened. There is no interparietal lamella. The umbilicus is wider [than in *hubbardi*] but somewhat variable; in a specimen 2.85 mm. in diameter the umbilicus is contained only 2¾ times."

[1] Published by permission of the Secretary of the Smithsonian Institution.

The sculpture is like that of *hubbardi,* but a little more regularly striate above, and not as smooth below as in that species. A critical examination of the few specimens from Bermuda in the collections of the United States National Museum has shown that this species is the only member of the subgenus *Discostrobilops* that possesses a *small columellar lamella!* It is visibly larger with a wider umbilicus than *S. hubbardi,* but is yet smaller in size and less coarse in sculpture than *S. sinaloa.*

The holotype was received from Mr. Haycock, from Whitby Cave, Bermuda. It is catalogued as USNM No. 618751, has 4.7 whorls and measures: height 1.4 mm., greater diameter 2.8 mm., aperture height 0.7 mm., aperture diameter 1.2 mm.; width of umbilicus 0.8 mm.

The broken paratype which is figured to show the lamellae, and two additional paratypes, are catalogued as USNM No. 251195, from the same locality and source.

Its geographic restriction as now known to the Bermudas, both Recent and Pleistocene, and its shell characters, are indications that *pilsbryi* is a distinct species, not a variation of *hubbardi.*

Strobilops sinaloa, new species. Plate 6, figs. 4–6.

The shell is large (for the group), subdiscoidal with very low spire, translucent, horn colored, irregularly coarsely ribbed above and smoothish below the rounded periphery. Nucleus of 1¼ whorls, smooth; postnuclear whorls irregularly closely ribbed above, the ribs obsolete on the base. Close, microscopic spiral lines are visible above and below, but are somewhat indistinct. The aperture is rounded lunate, with a moderately expanded and thickened lip. Parietal lamella strong, highest at the apertural end; infraparietal lower, internal, and not emerging to the aperture in adult shells. No interparietal lamella seen. Nearly a half whorl behind the aperture is a series of four basal folds, and one palatal fold *above the periphery.* The first basal is shorter, subconic; the outer three are longer, subequal, parallel and equally spaced, running for about one-tenth of a whorl. The single palatal fold is linear, a little shorter than the outer basals, and is a little farther behind the aperture than the basal folds.

The holotype, USNM No. 592719, has 4.7 whorls and measures: height 1.4 mm., greater diameter 3.1 mm. Aperture height 0.8 mm., aperture diameter 1.3 mm., width of umbilicus 1.0 mm.

This species may be easily distinguished by its large size, with wider whorls below and apparently proportionately narrower umbilicus than *S. pilsbryi.* It is much larger and irregularly coarser in sculpture above than *S. hubbardi.* It is the only species of the group now known with a palatal lamella (above the periphery).

The holotype was among specimens of snails intercepted November 20, 1948, by the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture at Nogales, Arizona, on succulent plants from Sinaloa, Mexico. It was taken in company with young individuals of *Humboldtiana* sp., *Bulimulus sp.,* and *Retinella indentata paucilirata* (Morelet). Whether it lives in Sinaloa in the same places as the species of *Humboldtiana* is at present unknown.

Three paratypes, USNM No. 522681, were intercepted by the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture on January 6, 1939, at San Francisco, California, on orchids shipped from Mexico. Presumably these specimens which agree with the type in all characters are also from western Mexico. The fact that they occurred on orchids may eventually lead to their discovery in nature and better localization of their habitat in the state of Sinaloa, Mexico.

Key to the American species of the subgenus Discostrobilops

A. Shell with a small columellar lamella in addition to four basals . . . *pilsbryi* Morrison. (Bermuda Islands.)

AA. Shell without any columellar lamella.

- B. Shells with basal lamellae only . . . *hubbardi* (A. D. Brown). (Florida; Gulf coast to northeast Mexico; Bahamas, Cuba, and Jamaica.)
- BB. Shells with four basal lamellae and one palatal lamella above the periphery . . . *sinaloa* Morrison. (Sinaloa, Mexico.)

VIVIPARUS MULTILINEATUS (SAY) 1829, FROM FLORIDA

By J. P. E. MORRISON [1]

Thomas Say at first thought this banded species was identical with the European genotype, since in his earliest works he included it under, or called it *Paludina vivipara.* In 1829 (New Harmony Disseminator, 2: 245) Say separated it, but he misidentified it as *elongata* of Swainson. However, with his description and remarks on the material at hand, he said it was from the St. John's River, Florida (LeConte), and proceded to publish and so validate his own manuscript name, *multilineata,* for this species. Although Say again called it *vivipara* in the American Conchology (part 1, plate 10, middle figures, 1830), he there figured the shell (holotype of *multilineata*) received from LeConte. Haldeman, in his 1840 Monograph, also published the name *multilineata* Say in the synonymy of his *bengalensis,* and refigured Say's holotype (plate 7, figs. 3–4).

Tryon in 1866 virtually renamed Say's Florida species, with the additional new material collected by Mrs. Walton, as *Vivipara waltonii.* He discusses at length and then rejects the name *multilineatus* Say, to rationally clear the way for his new name. Under present international rules of nomenclature, no available names may be rejected as Tryon did in this case on grounds of inappropriateness. The variety name *fasciatus* Tryon 1870 concerns only individual variation within the species, such specimens occurring with plain individuals in many populations from different localities.

Meanwhile, Isaac Lea had described *Paludina georgiana* from the Altamaha River, Georgia, in 1837. Considered distinct for many years, it remained for Goodrich (1942) to show it was identical with Say's species. Unfortunately, Goodrich did not look behind Lea's 1837 name for the possibility of earlier available names. Reexamination of all the specimens of the genus *Viviparus* in the United States National Museum collections has corroborated the statement of Goodrich (1942) that these is no specific difference between *georgianus* and *waltoni* (whose correct

[1] Published by permission of the Secretary of the Smithsonian Institution.

name is *multilineatus* Say). The synonymy of this Florida species includes:

1829. *Paludina multilineata* Say, New Harmony Disseminator, 2: 245; (Aug. 12, 1829); Mrs. Say's reprint (1840), p. 21; Binney's reprint (1858), p. 146. (in synonymy of *Paludina elongata* Say, not *P. elongata* Swainson 1822).
1830. *Paludina vivipara* Say (in part), American Conchology, part 1, plate 10, middle figures.
1837. *Paludina georgiana* Lea, Trans. Am. Phil. Soc., new series, vol. 5, p. 116, plate 19, fig. 85.
1840. *Paludina vivipara* Haldeman (in part), Monograph Limniades, part 1, p. 17, pl. 6, figs. 3–4.
1840. *Paludina georgiana* Haldeman, Monograph Limniades, part 1, p. 23, pl. 7, figs. 1–2.
1840. *Paludina bengalensis* Haldeman (in part), Monograph Limniades, part 1, p. 24, pl. 7, figs. 3–4.
1852. *Paludina georgiana* Küster, Conch. Cab., I(21): p. 15, pl. 3, figs. 7–8.
1852. *Paludina wareana* (Shuttleworth MSS in:) Küster, Conch. Cab., I(21): p. 21, pl. 4, figs. 10–11.
1862. *Paludina haldemaniana* (Shuttleworth MSS in:. Frauenfeld, Verh. K. K. Zool. Bot. Gesell. Wien, 1862, p. 1162.
1865. *Vivipara contectoides* W. G. Binney (in part), L. & FW. Shells N. Am., part 3, p. 23, fig. 48.
1865. *Vivipara georgiana* W. G. Binney, L. & FW. Shells N. Am., part 3, pp. 27–30.
1866. *Vivipara waltoni* Tryon, Am. Journ. Conch., Vol. 2, p. 108, pl. 10, fig. 2.
1870. *Vivipara georgiana* Tryon, Contin. Haldeman's Monograph, p. 16, pl. 14, fig. 5.
1870. *Vivipara georgiana fasciata* Tryon, Contin. Haldeman's Monograph, p. 17.
1870. *Vivipara waltonii* Tryon, Contin. Haldeman's Monograph p. 20, pl. 13, fig. 2.
1918. *Viviparus georgianus fasciatus* Walker, Catalogue, Misc. Publ. No. 6, Mus. Zool., U. of Mich., p. 125.
1918. *Viviparus haldemanianus* Walker, Catalogue, Misc. Publ. No. 6, Mus. Zool., U. of Mich., p. 125.
1918. *Viviparus waltonii* Walker, Catalogue, Misc. Publ. No. 6, Mus. Zool., U. of Mich., p. 127.
1918. *Viviparus wareanus* Walker, Catalogue, Misc. Publ. No. 6, Mus. Zool., U. of Mich., p. 127.
1942. *Viviparus georgianus* Goodrich, Nautilus, 55 (3), p. 88.
1942. *Viviparus georgianus* form *wareanus* Goodrich, Nautilus, 55 (3), p. 90.

To summarize briefly, the earliest valid specific name for the common banded viviparous pond snail, from the Altamaha River, Georgia, to the St. John's River, and east-central Florida, in the lakes in general, is *Viviparus multilineatus* (Say) 1829. This name is one of the few not listed in Sherborn, but nothing in Sherborn's Index Animalium (1801–1850) indicates it could be preoccupied, either.

There are four other valid and distinct forms (subspp. or spp.?) of *Viviparus* known from the Florida Region, namely:

Viviparus multilineatus altior Pilsbry 1892, from kitchen middens along Hitchen's Creek, Lake George, Florida.

Viviparus multilineatus limnothaumus Pilsbry 1895, from Lake George, and westward in Western Florida rivers.

Viviparus (*multilineatus ?*) *walkeri* Pilsbry & Johnson 1912, from Juniper Creek, Lake County, Florida.

Viviparus (*multilineatus ??*) *limi* Pilsbry 1918, from the Flint River system in Georgia and West Florida.

The last named form may better belong to the *multilineatus* complex, rather than to *contectoides,* on the basis of shell characters and distribution. The body-whorl of *limi* is much larger and more expanded, flattened laterally, markedly less rotund, than the body whorl of *contectoides.* The National Museum collections do not include specimens of *Viviparus contectoides* from any part of the Florida Region.

THE CASE OF PALUDINA MULTILINEATA SAY

By H. A. PILSBRY

This paper may be regarded as supplemental to that preceding (p. 56), for the purpose of directing attention to some considerations which the author of that paper overlooked or thought unimportant. It should be mentioned that he had been informed of the objection to his conclusions.

In his paper of 1829 in the New Harmony Disseminator, Say gave the following paragraph:

"3. *P. elongata,* Swainson. Capt. Leconte presented me with a shell which, he informed me, he found in the river St. John,

Florida. I described it nearly four years since under the name of *multilineata,* but recently, being about to publish it, on a more attentive examination and comparison with a specimen of the *elongata* from Calcutta, given to me by Mr. Hyde of Philadelphia, I have concluded that it varies from that specimen only in having the umbilicus a little smaller.''

Say never figured [*Paludina*] *multilineata,*[1] and the only ''description'' he gave is: ''it varies from that specimen [*Paludina elongata* Swainson from Calcutta = *V. bengalensis* Lam.] only in having the umbilicus a little smaller.'' This definition cannot possibly apply to *V. georgianus.*

Paludina elongata Swainson (1821–2, pl. 98, upper and lower figures) is a rather long-spired acute species having many dark lines and narrow bands on an olive ground. It has long been recognized as synonymous with *Viviparus bengalensis* (Lamarck), and Swainson's figures well represent that well known Indian species.

A specimen (No. 27007) given by Mrs. Say to the Academy of Natural Sciences after Say's death, is believed to be Say's type of *multilineata,* but as it does not bear Say's label to that effect, we do not have absolutely positive evidence. Since Say mentioned *multilineata* only to discredit it, he would not be expected to keep that name in his collection. This specimen was figured by Haldeman, *Paludina,* pl. 7, figs. 3, 4 (copied by W. G.

[1] Dr. Morrison's statement that Say, in American Conchology, ''figured the shell (holotype of *multilineata*), received from LeConte'' is not supported by any published evidence. In that work Say stated that he had two specimens of ''*P. vivipara*'' (the early writers thought *V. georgianus* Lea and *V. contectoides* W.G.B. were identical with this similar European species) from the St. Johns River from Mr. Elliott, and one from Capt LeConte, who ''obtained it at Lake George on the same river.'' Say did not given any locality or collector for the specimen (of ''*P. vivipara*'' = *V. georgianus*) he figured. In his synonymy of *P. vivipara* Say did not mention *P. elongata* Swains, or *multilineata* Say, as he certainly would have done had he considered them identical with ''*P. vivipara*'' Captain LeConte had given ''St Johns River'' as locality for *multilineata,* not Lake George.

Dr. Morrison stated that American Conchology plate 10, middle figures, and Haldeman, Paludina, pl. 7, figs. 3, 4 are both illustrations of the holotype of *multilineata.* A comparison of these very different figures gives one a measure of the reliability of his statements; many of them seem equally ''ambiguous.''

Binney, 1865, p. 61, fig. 125). It is a "dead" specimen, faded, but still showing six of the darker bands and it is indistinctly subangular in the infraperipheral region.

Nelson Annandale, the brilliant zoologist of the Indian Museum, published an anatomic, ecologic and taxonomic study of *V. bengalensis* in which the several forms of that species are described. The Say type specimen of *multilineata* corresponds closely with Annandale's plate 2, fig. 8, *V. bengalensis* phase *annandalei* Kobelt, from pools in the Calcutta region polluted by domestic use. He appears to consider it a depauperate ecologic form or phase owing to the contaminated habitat, rather than a true subspecies. No competent conchologist who examined the specimen could confuse this Say shell with any form of *V. georgianus,* and Say and Haldeman did not do so. Dr. Morrison, whose competence we do not question, evidently based his reference to *georgianus* upon a cursory glance at the Haldeman figures, and implicit reliance upon the assigned locality.

In this matter of the locality of *multilineata* the following note becomes important.

On the same page of the Disseminator with *multilineata,* Say described *Ampullaria rotundata,* which also was given to him by Capt. LeConte, "who informed me that he found it in St. Johns river in Florida." *Ampullaria rotundata* was described as having a calcareous operculum. Beautiful figures of shell and operculum drawn by Mrs. Say are pl. 75 of Say's American Conchology, but it did not appear in the text of that unfinished work. *A. rotundata* is a synonym of *Ampullaria* (now *Pila*) *globosa* Swainson (1822, pl. 119), an Indian species.

It seems to me quite incredible that such an acute observer as Say would confuse any form of *V. georgianus* (Lea) with *V. bengalensis,* or that he would have given a speciment of *V. georgianus* the name "multilineata." Say was no bungler at conchology; nearly every species he described has been recognized and is still considered valid. If the LeConte shell had been any form of *V. georgianus,* Say surely would have compared it to *V. vivipara* which he knew, not with a very different Indian species.

It appears reasonably evident that a mixture of specimens

was made by Captain LeConte, and the specimens of *Paludina* and *Ampullaria* given to Say were both common Indian species and not from the St. Johns River. Any attempt to resurrect either name for an American species seems to me erudition misdirected.

References

Lamarck, M. le Chevalier de, 1819. Hist. Nat. Animaux sans Vertèbres, VI.

Swainson, William, 1821–2. Zoological Illustrations II.

Say, Thomas, 1829. (New Harmony) Disseminator of Useful Knowledge, Aug. 12.

Haldeman, S. Stehman, 1840–46. Monograph of the Fresh-water Univalve Mollusca of the U. S. *Paludina.*

Binney, W. G., 1865. Land and fresh-water shells of N. A., part III, p. 61.

Annandale, Nelson, 1921, Records Indian Museum, XXII.

A REVIEW OF MARKS' SUBGENERA OF BUSYCON RÖDING, TOGETHER WITH REMARKS PERTAINING TO THE GENUS [1]

By WILLIAM K. EMERSON

Museum of Paleontology, University of California

The late E. Sydney Marks recently erected (1950: 34) *Fulguropsis* and *Sycofulgur* as new subgeneric names for the well-defined gastropod genus *Busycon.* In proposing *Fulguropsis* as a new subgenus to replace "*Sycotypus* Gill, 1867, not Gray, 1847,"[2] Marks apparently overlooked Wenz's (1943: 1219) earlier valid replacement of *Sycotypus* Gill. Thus, *Fulguropsis* Marks, 1950 [type species: *Busycon pyrum* (Dillwyn)] is a junior subjective synonym of *Busycotypus* Wenz, 1943 [type species: *Busycon canaliculatum* (Linné)]. Marks established the subgenus *Sycofulgur* for the Miocene species *Busycon rugosum* (Conrad) and differentiated it from *Fulguropis*

[1] Contribution from the Museum of Paleontology, University of California, Berkeley, California.

[2] Actually, not Gray, but Mörch, 1852: 110.

[= *Busycotypus*] by the possession of "nodes on its shell throughout its growth." The acceptance of *Sycofulgur* as a nomenclatural category higher than a "section" is not in harmony with the generally accepted classification of *Busycon* (*sensu lato*). It is the writer's opinion that in order to perspicaciously utilize *Sycofulgur* as a subgenus, it would be necessary to raise the presently recognized subgenera of *Busycon* to full generic status, and in turn name and treat the several bio-temporal species groups which comprise the genus as subgeneric units. Though the considerable available data may be sufficient to undertake such a revision, there still remain many unsolved taxonomic problems [3] which would appear to preclude any radical nomenclatural changes in the classification of the genus at this time.

General remarks pertaining to the Busycons

The busycons constitute one of the most prominent molluscan elements in the eastern American Cenozoic marine faunas. Available data would indicate that the group originated in the Upper Cretaceous of eastern America as small, thin-shelled species, and gradually evolved into many large, heavy-shelled species. The genus attained an apparent acme in the Miocene of the Atlantic coastal region, and is represented in the Recent faunas by a few, but very conspicuous species, which, like their fossil predecessors, are limited in distribution to the western Atlantic coasts.

A number of writers have undertaken phylogenetic and taxonomic studies of the genus. Prominent among these are: Gill (1867), Conrad (1867), Dall (1890), Grabau (1903), Smith (1914), Wade (1917), and Gardner (1944; 1948). The most recent classification of the genus is that of Wenz (1943). Unfortunately, the section of this work in which the genus appears is not generally available in this country. Inasmuch as the busycons are of particular interest to American students, a partial résumé of Wenz's classification of the genus, together with additional data, is provided below:

[3] Especially perplexing is scarcity of data pertaining to the Eocene history of the genus; the significance of the sinistral forms is not thoroughly understood.

Family GALEODIDAE

Subfamily BUSYCONINAE [4]

Genus *Busycon* Röding, 1798

Busycon "Bolten" Röding, 1798, Museum Boltenianum, pt. 2, p. 149.
Busycum "Bolt." Mörch, 1852, Cat. Conch. Yoldi, vol. 1, p. 104.
Busicon "Con[rad]" Emmons, 1858, Rept. North Carolina Geol. Surv., p. 248.

Type species: (by subsequent designation, Smith, 1938: 20) [5] *Murex carica* Gmelin, 1790 = *Busycon carica* (Gmelin).
Geologic range: Upper Cretaceous to Recent.

Diagnostic characters: Shell large, pyriform, thin to heavy; spire short, terminating in a paucispiral, papillate nucleus; body whorl large, inflated; columella long, slender with a single, somewhat obsolete fold; spiral sculpture usually developed; axial sculpture expressed by growth lines and resting stages, often tuberculate or spinose upon the periphery of the whorls; anterior canal long, open, somewhate recurved; posterior canal lacking; operculum ovate, with apical nucleus; periostracum thin, simple or ciliated.

Subgenus *Protobusycon* Wade, 1917

Protobusycon Wade, 1917, Amer. Journ. Sci., ser. 4, vol. 43, p. 295; Cossmann, 1917, Rev. Critique Paléozool., Année 20, no. 3, p. 100; Wade, 1926, U. S. Geol. Surv. Prof. Paper 137, p. 136.

Type species: (by monotypy) *Busycon cretaceum* Wade, 1917.

[4] Wenz (1943: 1211) followed Thiele (1931: 319) in not allocating to the group a subfamily name, and placed Melongenidae *auct.* and Busyconidae *auct.* (Fulguridae) in the family Galeodidae. See Wade (1917: 295) for a review of the group's previous family and subfamily assignments.

[5] Smith (1938) has made a critical and apparently exhaustive study of the involved type designation for this genus. He concludes that none of the previous designations are valid, selecting *Busycon carica* (Gmelin) as the type species. Although this designation appears to be valid, the citation of *Busycon muricatum* Röding, 1798 [= *Murex carica* Gmelin, 1790] as the type species would have been in strict adherence to the Règles.

Geologic range: Upper Cretaceous [Ripley Formation, McNairly Co., Tennessee (Senon.)].

Diagnostic characters: Shell small for genus; character of protoconch unknown; axial sculpture restricted to low, subspinose nodules upon periphery of the whorls; a secondary keel outlines base of body whorl, keel beset with 4–5 obsolete spines; shallow sulcus at base of body whorl, terminating as a slight projection at the margin of the inner lip.

Subgenus *Busycon* (*sensu stricto*)

Fulgur Montfort, 1810, Conch. Syst., vol. 2, p. 502, type species: (by original designation) *Fulgur eliceans* Montfort, 1810 = *Busycon eliceans* (Montfort).

Fulgus "Montf." Desmarest, 1856 [*In Chenu*], Enc. Hist. Nat., Crust. Moll. Zooph., p. 179.

Sycopsis Conrad, 1867, Amer. Journ. Conch., vol. 3, p. 184, type species: (here designated) *Busycon tuberculatum* (Conrad), 1840.

Geologic range: [?Eocene], Oligocene to Recent.

Diagnostic characters: Shell large to very large; axial sculpture typically spinose or tuberculate on the periphery of the whorls, whorls not separated by canaliculate suture; periostracum simple, not ciliated; radular dentition: rhachidian tooth 5–6 dentate, laterals 5–6 dentate, *fide* Stimpson.

Subgenus *Busycotypus* Wenz, 1943

Sycotypus "Browne" Gill, 1867, Amer. Journ. Conch., vol. 3, p. 147, type species: (by original designation) *Sycotypus canaliculatus* (Linné), 1758 = *Busycon canaliculatum* (Linné). Not *Sycotypus* Mörch, 1852, Cat. Conch. Yoldi, vol. 1, p. 110.

Busycotypus Wenz, 1943, Handb. Paläozool., vol. 6, Gastropoda, div. 6, pt. 8, p. 1219 [new name for *Sycotypus* Gill, 1867, not Mörch, 1852].

Fulguropsis Marks, 1950, Nautilus, vol. 64(1), p. 34, type species: (by original designation) *Bulla pyrum* Dillwyn, 1817 = *Busycon spiratum* (Lamarck), 1816 [new subgenus replacing "*Sycotypus* Gill, 1867, not Gray, 1847"].

Sycofulgur Marks, 1950, Nautilus, vol. 64(1), p. 34, type species: (by original designation) *Fulgur rugosus* Conrad, 1840 = *Busycon rugosum* (Conrad).

Type species: (by original designation) *Murex canaliculatus* Linné, 1758 = *Busycon canaliculatum* (Linné).

Geologic range: Miocene to Recent.

Diagnostic characters: Shell large to very large; whorls separated by deep canaliculate suture; axial sculpture typically tuberculate in juveniles, uniting, in senility, to form rounded or keeled shoulders on the periphery of the whorls; periostracum ciliated; radular dentition: rhachidian tooth 3 dentate, laterals 4–5 dentate, *fide* Stimpson.

Literature

Clench, W. J., 1951, *Busycon coarctatum* Sowerby. Occasional Papers on Mollusks, vol. 1, no. 16, pp. 405–409, pl. 50.

Conrad, T. A., 1867, Synopsis of the genera *Sycotypus* Browne and *Busycon* Bolten. Amer. Journ. Conch., vol 3 (2) pp. 182–185.

Dall, W. H., 1890, Contributions to the Tertiary Fauna of Florida. . . . Part 1, Trans. Wagner Free Inst. Sci., Philadelphia, vol. 3, pp. 109–118, pls. 4, 9 [*Fulgur*].

Gardner, Julia, 1944, The Molluscan Fauna of the Alum Bluff Group of Florida, pt. 7. U. S. Geol. Surv. Prof. Paper 142–G, pp. 449–458, pls. 49–50 [*Busycon*].

——, 1948, Mollusca from the Miocene and Lower Pliocene of Virginia and North Carolina, pt. 2. U. S. Geol. Surv. Prof. Paper 199–B, pp. 238–243, pls. 33–36 [*Busycon*].

Gill, Theodore, 1867, On the genus *Fulgur* and its Allies. Amer. Journ. Conch., vol. 3 (2), pp. 141–152, text fig.

Grabau, A. W., 1903, Studies of Gastropoda. II. *Fulgur* and *Sycotypus*. Amer. Naturalist, vol. 37, pp. 515–539, 19 text figs.

Marks, E. S., 1950, New subgenera of *Busycon* Roeding. Nautilus, vol. 64 (1), p. 34.

Smith, Burnett, 1914, Morphologic sequences in the canaliculate Fulgurs. Acad. Nat. Sci. Phila., Proc., vol. 66, pp. 567–578, pl. 24.

——, 1938, *Busycon carica* (Gmelin) as a Genotype. Nautilus, vol. 52 (1), pp. 16–20.

——, 1939 a, A sinistral specimen of *Busycon pyrum* (Dillwyn). Nautilus, vol. 52 (3), pp. 89–91, pl. 7, figs. a-c.

——, 1939 b, Type specimen of *Busycon perversum* (*Murex perversus* Linné). Nautilus, vol. 53 (1), pp. 23–26, pl. 7, figs. 1–2.

THIELE, JOHANNES, 1931, Handbuch der Systematischen Weichtierkunde, Jena, p. 321 [*Busycon*].

WADE, BRUCE, 1917, An Upper Cretaceous *Fulgur*. Amer. Journn. Sci., ser. 4, vol. 43, pp. 293–297, 2 text figs.

WENZ, W., 1943, *in* Schindewolf, O. H., Handbuch der Paläozoologie, vol. 6, Gastropoda, div. 6, pt. 8, pp. 1216–1219, figs. 3464–3466 [*Busycon*].

AMERICAN MALACOLOGICAL UNION, NINETEENTH ANNUAL MEETING

BY MARGARET C. TESKEY

The American Malacological Union invaded the nest of the Kansas Jayhawk late in June (1953) and found the large-beaked bird with the purposeful mien to be a very hospitable fellow indeed. For he is the mascot of the University of Kansas, which was host to the A.M.U. on occasion of the nineteenth annual meeting. All sessions and the annual dinner were held in the beautiful Memorial Union Building, of which the "Jayhawkers" are justly proud. Proud too of their Natural History Museum, where the visitors were conducted on a behind-the-scenes tour. Both of these buildings are on the campus which occupies what must surely be one of the most beautiful spots in Kansas; its hilltop location with the Kaw river in the background overlooks the little city of Lawrence.

Although but seventeen persons were able to accept the invitation of Dr. A. Byron Leonard, the meeting was an unqualified success. The weatherman cooperated by knocking down the heat wave which during the previous week had set a record of 118°, and delegates from cooler climes had no complaint as perfect summer weather prevailed during the three days the meeting was in session, June 25th through the 27th.

A meeting of the Executive Council followed registration, followed in turn by the annual business meeting. A revised Constitution was submitted by the committee appointed for that purpose; approved by the Council, it will be placed before

the membership which will then be polled for its acceptance or rejection. Three persons whose contributions to the field of American malacology have been outstanding where honored with life memberships: Dr. Paul Bartsch, Dr. S. Stillman Berry, and Dr. Henry A. Pilsbry. The invitation of Dr. George M. Moore to hold the 1954 meeting at the University of New Hampshire was accepted. And finally, the following panel of officers was nominated by the Council and elected to serve for the following year:

President: Dr. Joseph C. Bequaert
Vice-president: Mr. M. K. Jacobson
2nd Vice-president: Mrs. Elsie M. Chace
Secretary Treasurer: Mrs. Margaret C. Teskey
Councillors-at-Large: Mr. R. Tucker Abbott
Mr. Ralph W. Jackson
Dr. Miguel Jaume
Dr. Albert R. Mead

Presentations of papers and subsequent discussion occupied the afternoon of opening day. In the evening the delegates were entertained by Dr. Jeanne S. Schwengel in the Crystal Room of the Eldridge Hotel, the social hour followed by a buffet supper.

Papers were presented at the morning and afternoon sessions of the second day, and before the delegates returned to the hotel to dress for the evening they were entertained by Dr. and Mrs. Leonard who held open house at their home from 4:00 until 5:00.

The annual dinner was held in the Sunflower Room of the Memorial Union Building, and following a repast of Kansas beef with all the trimmings, Dr. Myra Keen presented the film of Japanese pearl culture which had entertained west coast malacologists at the earlier meeting of the A.M.U.P.

The final event was the day-long field trip to the Ottawa river, about twenty-five miles south of Lawrence. Eleven people made the trip, returning sunburned, happy and laden with loot, convinced to a man that this had been the best meeting ever!

These papers were presented at the nineteenth annual meeting:

Molluscan Faunal Successions in the Pleistocene of the Great Plains
A. Byron Leonard, University of Kansas
The Economic Significance of Using Giant African Snail Meal as a Poultry Feed
Albert R. Mead, University of Arizona
Snail Hosts of Schistosomiasis in British West Africa
Elmer G. Berry, National Institutes of Health
Some Peculiarities of the West African Terrestrial Molluscan Fauna
Joseph C. Bequaert, Museum of Comparative Zoology
A Preliminary Report on Molluscan Types of Frank Collins Baker
Dorothea Franzen, Illinois Wesleyan University
Additional Introductions of Foreign Snails Into Arizona
Albert R. Mead, University of Arizona
Ten-Weeks Tour of Raroia Atoll, Tuamotu Islands and French Oceania; A film
Joseph P. E. Morrison, United States National Museum
A Progress Report on Some Revisions for the "Treatise of Invertebrate Paleontology"
A. Myra Keen, Stanford University
Brief Report on the Walter Webb Collection
Fritz Haas, Chicago Natural History Museum
Zoogeography, Subfamilies and Families
Joseph P. E. Morrison, United States National Museum

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REDISCOVERY OF TWO CALIFORNIAN LAND SNAILS

By G. D. HANNA and A. G. SMITH

California Academy of Sciences

MONADENIA CIRCUMCARINATA (Stearns)

Helix var. *circumcarinata* Stearns, Ann. N. Y. Acad. Sci., vol. 1, 1879, p. 316, plate 8, figs. 5, 6, 7.—Nautilus, vol. 16, 1902, pp. 61–62. [Compared to "*Pyramidula*" *elrodi* Pilsbry.]

Arionta mormonum var. *circumcarinata,* Stearns, W. G. Binney, Fifth Suppl. to Terr. Moll., Vol. 5, Bull. No. 8, 1883, Mus. Comp. Zool., Harvard Coll., pp. 158–159, pl. I, fig. K.—Binney, Man. Am. Land Shells, Bull. U. S. Nat. Mus., vol. 28, 1885, pp. 142–143, fig. 121.

Epiphragmophora circumcarinata (Stearns), Pilsbry, Nautilus, vol. 14, 1900, p. 41.—Pilsbry, Nautilus, vol. 16, 1902, p. 62–64. [Distinguished from *Pyramidula elrodi.*]—Stearns, Nautilus, vol. 16, 1902, pp. 83–84.—Keep, West American Shells, 1904, pp. 128, 304.—Keep, West Coast Shells, 1911, p. 278, fig. 269.—Hanna & Rixford, Proc. Calif. Acad. Sci., Ser. 4, vol. 12, 1923, p. 43.—Pilsbry, Nautilus, vol. 36, 1923, p. 141.

Epiphragmophora (*Monadenia*) *circumcarinata* (Stearns), Pilsbry, Nautilus, vol. 11, 1897, p. 48. "Turlock, Stanilaus [sic] Co., Cal."

Monadenia circumcarinata (Stearns), Hanna & Smith, Nautilus, vol. 46, 1933, p. 85. [Compared with *M. troglodytes* H & S.]—Keep, West Coast Shells (Baily Rev.), 1935, p.

303, fig. 319.—Pilsbry & Cockerell, Nautilus, vol. 51, 1937, p. 24. [Compared to *Dinotropis harringtoni* P & C.]—Hanna, Nautilus, vol. 52, 1939, p. 139.—Pilsbry, Land Mol. of N.A. (North of Mex.), Monog. 3, Acad. Nat. Sci. Philadelphia, vol. 1, pt. 1, 1939, pp. 62–63, fig. 29. [Description, with notes by A. G. Smith.]

Seventy-four years ago some remarkable land shells were brought to R. E. C. Stearns and were described by him as *Helix* var. *circumcarinata* from the prominent keel surrounding the shell. They were furnished by A. W. Crawford, who stated that they were found near Turlock, Stanislaus County, California, and that they were given to him by a friend. At a later date Stearns evidently realized that the locality was an unlikely one; so he made further inquiry and Crawford stated it was an error and "near Columbia, Tuolumne County" was correct. As a result of this discrepancy the real type locality of *M. circumcarinata* may never be learned.

Many people have searched for the species without success. Among those known to us were the famous collectors Henry Hemphill and James H. Ferriss. The town of Turlock is located out in the flat San Joaquin Valley, now intensely cultivated by irrigation but originally very dry and hot in summer, with no cover for land snails of this kind. Columbia, in Tuolumne County, is a much more likely locality because there are abundant exposures of marble in the vicinity, it is lightly forested, and there is moisture, even in the summer time. Consequently much fruitless search has been devoted to that area. Another Columbia, a small hamlet in Nevada County, much farther north, has been investigated and abandoned as unlikely territory.

Not until June 10 of this year had there turned up a single clue to the home of this fine species. On that day Mr. Raymond deSaussure, of San Francisco, brought to one of us (A.G.S.) an excellent dead specimen that he had picked up on the surface in Tuolumne County. Mr. deSaussure is a speleologist and at the time was searching for a "lost" cave, not a land snail. He described the spot in minute detail (there is an excellent topographic map of the area) and agreed to accompany us to it. Opportunity came on July 11, 1953 with the result that 50 adult

specimens and many juveniles were collected during the day. All these were in limestone crevises or talus piles and all were dead. However, we have good reason to suspect that the species is living there because our collecting was done at the height of the dry season and on the very steep, hot and dry southern exposure of the canyon of the Tuolumne River.

The exact area of our investigation is shown on the illustrated portion of U. S. Geological Survey Topographic Map, 7.5 minute series, Tuolumne, California, scale 1:24,000 (1949). It may be described more explicitly as follows: Take the paved road from Sonora to Tuolumne City, and from there continue on over an unimproved road across the North Fork of the Tuolumne River and across Hunter's Creek to the Buchanan Mine. From this point proceed southwest to the end of a poor road along Paper Cabin Ridge called "Ponderosa Way," where there is another abandoned mine. Many steep grades will test the low gear of the modern automobile but there are no high centers in the road. This last mine has buildings located in a level park-like area and the underlying rock is limestone, metamorphosed into a gray marble. The mass is probably a southeast extension of the great deposit in the vicinity of Sonora, as shown on the U. S. Geological Survey Sonora Folio No. 41 (1897).

From the mine it is only a short distance southeastward and down where there are bold outcrops of marble on the steep slope of the river canyon. We found numerous specimens in the first outcrop that had loose rocks and then followed the deposit eastward toward Sugar Loaf Hill as far as was practicable in one day. Our route, which is sketched on the map, leads down the 45-degree slope to the Tuolumne River, then up the river a quarter of a mile or so to a rugged side canyon with a small stream flowing down it, but dry at the end at this time of year. Massive outcrops of marble could be seen high up on either side of this canyon, so we proceeded up it a short distance searching diligently in likely spots. No *circumcarinata* were found on the way down to the river after the limestone gave way to schist except for a few bleached "bones" picked up on the surface, which had been washed down from higher up. None was found along the river in the schist, and it was not until we reached the marble again up the canyon just mentioned that we collected a

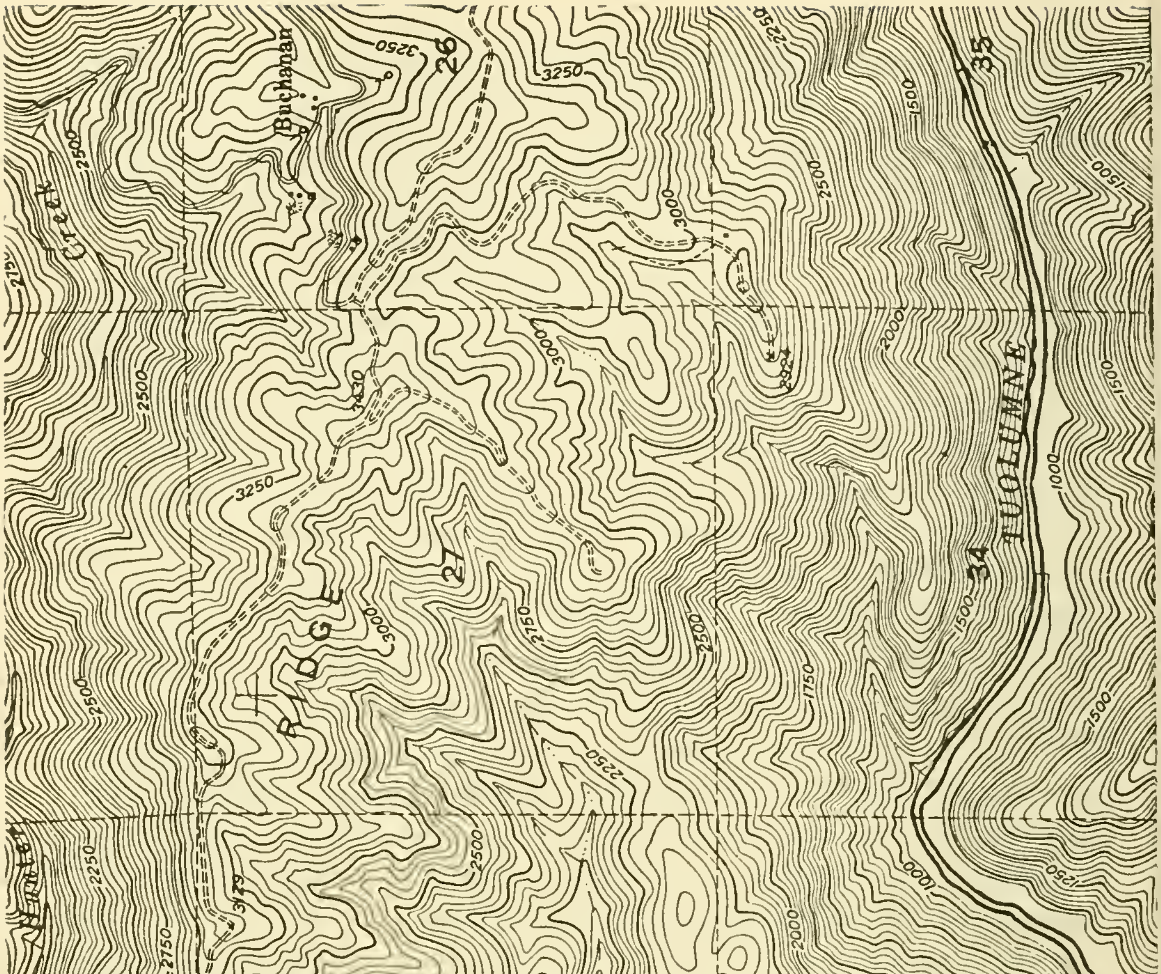

FIG. 1. Explanation on opposite page.

couple of additional dead specimens. Time did not permit further exploration up this canyon.

It seems clear that *circumcarinata* prefers a lime-bearing habitat. Any further exploration to define the limits of its range, in this area at least, probably should be confined to the limestone belt just under Paper Cabin Ridge. Dropping down below this to the bottom of the canyon of the Tuolumne, a distance of 1500 feet, and particularly the tough pull out again, is an experience we would prefer not to repeat, especially as the result would undoubtedly be unproductive.

The common foothill snail *Helminthoglypta cypreophila* (Bland & Binney) was found associated with *M. circumcarinata* in a ratio of about five to one of the latter. This species was found in slides of schist as well as marble and several fine adult living specimens were collected where they were in hibernation. The only other species of land snail collected was *Haplotrema alameda* Pilsbry, a few dead specimens of which were taken in leaf mold in a slide of schist not far up from the mouth of the side canyon explored. A search along Hunter Creek, where we camped over night, produced only *H. cypreophila.* Along the North Fork of the Tuolumne where the road crosses we found this species also and one or two *Zonitoides arboreus* (Say). Leaf mold brought back from the North Fork for later sifting was unproductive.

Only a few of the specimens of *M. circumcarinata* we collected showed the peripheral brown band and only two of the adults retained the thin periostracum. One of the latter has the secondary lighter brown band mentioned by Pilsbry (1939, p. 62). All surface specimens were bleached pure white. Others found buried in the silt of crevices or well down in talus piles were in rather bad condition; some had been dead undoubtedly for a great many years.

Sculpture of our specimens varies a good deal in minor particulars. The number, spacing, and strength of the transverse ribs are quite variable, as are the size, shape and density of the

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FIG. 1. Part of U. S. Geol. Survey. Topographic Map, Tuolumne Quadrangle, Tuolumne County, California, showing points of collection of *Monodenia circumcarinata* (Stearns). The center of Sec. 28 is the place where Mr. De Saussure rediscovered the species.

underlying papillose sculpture. Many of our specimens have well impressed sutures, with the whorls convex, as Stearns described them and as shown in Pilsbry's paratype figure (1939, fig. 29). On several others the sutures are not impressed, giving the whorls above the carina a spire of beehive shape; this results in a shell of slightly greater over-all height. Mr. deSaussure's shell (AGS No. 9419), found at the center of Section 28 on the map, is of this form.

Twenty specimens of our lot show the following measurements:

	Average	*Range*
Maximum diameter	27.2 mm.	25.3 to 30.5 mm.
Minimum diameter	22.3 mm.	20.7 to 24.1 mm.
Height	11.5 mm.	10.4 to 12.4 mm.
Diameter of umbilicus	4.7 mm.	4.1 to 5.6 mm.
Number of whorls	5¾	5⅛ to 6¼

Nine shells from the original lot collected by Crawford (one figure on plate 8, fig. 5–7) are available for comparison with the present lot, as follows:

C.A.S. No. 7607 Two adults and 1 juv. (fine specimens); Hemphill Coll., from Crawford (?).
C.A.S. No. 29961 Two adults, bleached (or faded?); Rixford Coll., from Crawford (?).
A.G.S. No. 2566 Two adults, one good, one bleached; Univ. California Coll., from Clark.
A.G.S. No. 8808 One adult and one juv., bleached; Raymond Coll., from Herrman, an early San Francisco dealer in shells.

Some of these were certainly collected alive and the others, though bleached, all appear not to have been long dead when taken. All of them have fairly strong to prominent transverse ribbing; and all have well impressed sutures. In our lot the transverse ribs are relatively weak—in some they are reduced almost to coarse lines of growth. From this we assume our shells did not come from the exact spot where the original lot was found, which is quite likely to be a more favorable locality and one that should produce better, if not living material, if it can be located.

Vertigo dalliana (Sterki)

Pupa dalliana Sterki, Nautilus, vol. 4, 1890, p. 19; p. 39, pl. 1, fig. 2 [as *Vertigo dalliana*].

Vertigo dalliana, Binney, 4th Suppl. Terr. Moll. V, Bull. Mus. Comp. Zool., Harvard Coll., vol. 22, 1892, p. 195, text fig.—Pilsbry, Nautilus, vol. 11, 1898, p. 119.—Pilsbry, Man. Conch., vol. 25, 1919, pp. 137–138, pl. 11, fig. 1 [Length corrected from 1.2 to 2.1 mm.].—Pilsbry, Land Moll. of N.A. north of Mex., Acad. Nat. Sci. Philadelphia, Monog. No. 3, vol. 2, pt. 2, 1948, p. 994, fig. 517–1 on p. 964.

This species was described by Sterki in 1890 from 15 specimens sent to him by Hemphill, the locality being given as near Clear Lake, Lake County, California. So far as we know, it was not collected again until 1952, although it has been looked for repeatedly. In July 1952, while doing geological work in northwestern California, Mr. Salem Rice and one of us (G. D. H.) happened to visit Sanger Lake. In some leaf mold that was collected near the shore line were seven specimens of *V. dalliana*. This is a long way from "near Clear Lake" but the shells have all the necessary characters, as given by Sterki and as shown by comparison with six specimens of the original lot in the California Academy of Sciences collection, which Hemphill labelled "Types."

Sanger Lake is a quite small body of water located in a glacial cirque 1¼ miles southeast of Sanger Peak, in the SE corner of Sec. 31, T18N, R5E, M.D.B. & M, at an elevation of 5050 feet. This is shown on the 1922 edition of the Preston Peak Quadrangle map, U. S. Geological Survey. The road from O'Brien, Oregon, to the Cyclone Chrome Mine passes by the lake; it is 6½ miles south of the Oregon border in Siskiyou County, California. The lake is bordered by a fine stand of the rare Weeping Spruce (*Picea breweriana* Watson) and the equally rare Sadler Oak (*Quercus sadleriana* R. Br. Campster). Willows and alders contributed most of the debris forming the leaf mold in which the shells were found. The situation was decidedly on the damp side but was not definitely wet. With this clue as to habitat perhaps the species can now be found closer to the original locality.

Other mollusks found with *V. dalliana* were *Punctum, Haplotrema, Vespericola, Prophysaon,* and *Monadenia* (*fidelis* group).

August 16, 1953

THE "TEXAS LONGHORN SHELLS" FROM THE FLORIDA WATERS

By Elizabeth Deichmann

From Mr. J. H. Butler, Marathon, Florida, has been received an interesting series of what by first look appeared to be gastropod shells—more or less of the *Planorbis*-type—and completely overgrown by a porous calcareous substance which on each side extends into a long tapering horn, at right angle to the plane of the shell. In the smallest of the seven shells there is furthermore a series of shorter horns, arranged as a coxcomb along the median line of the shell. For these odd structures Mr. Butler has coined the most appropriate name "Texas Longhorn Shells," and he has been fortunate enough to round off the collection with the inhabitant of one of the larger shells—a small hermit crab with almost straight abdomen, and the right claw modified into a flat operculum with which it can close the opening of the shell.

The six large shells proved to be overgrown by the bryozoan *Hippoporidra edax* (Busk) while the seventh, much smaller and more delicate one, was overgrown by the closely related form *H. calcarea* (Smitt). The hermit crab was found to be a rare form, *Pylopagurus ungulatus* (Studer), originally described from South African waters, and later reported by Milne Edwards and Bouvier from West Indian waters, that is, around Florida and Yucatan.

Both the species of bryozoans were also previously reported from the West Indies, having been captured by Pourtalès in connection with his classical Gulfstream Explorations. Canu and Bassler established in 1927 a genus, *Hippoporidra,* to take in these closely related forms, partly recent, partly fossil, which are supposed always to live on gastropod shells, and both species were described in the following year, with figures, records of

their earlier distribution, and references. Whether the two authors are correct in defining *Hippoporidra* as a genus which exclusively lives on mollusk shells is debatable, for one of Smitt's figures, his var. *calcarea,* shows a colony growing "in raised stems of pumicose consistence." His other figure of what he considers a fragment of a *Serpula* tube which has been overgrown by the bryozoans and then absorbed, is probably correctly interpreted as identical with a fragment of a gastropod shell. Also Verrill's note that *H. edax* is found on corals in Bermuda indicates an independence of the mollusk shell as substratum. The two authors were apparently unaware of the commensalism which exists between the bryozoan-covered mollusk shell and the hermit crab, which inhabits the shell and has its house enlarged by the growing colony.

Only three cases are known of such a commensalism between hermit crabs and bryozoans on gastropod shells; they have been reviewed by Balss in 1924, and all were based on material from West Africa.

In the shell overgrown by the bryozoan *Conopeum commensale,* Kirkpatrick found the shell inhabited by *Pagurus granulimanus* Miers, and the author was able to follow the gradual overgrowth of a *Turitella*-shell until it was transformed into a bryozoan-covered ball with the original shell absorbed and the hermit crab occupying a tube formed by the skeleton of the bryozoans. Kirkpatrick holds that the bryozoan never occurs except on mollusk shells and that is a clear case of mutual benefit, the hermit crab being released from the trouble of having to hunt for a larger house and the bryozoans being dragged around to, presumably, better feeding grounds.

In the two other cases the shape of the colony recalls somewhat that of the two West Indian forms. Stechow has tentatively, in 1921, named the bryozoans, *Celloma keruniformis* and *Keruniella valdividae,* but the names are still *nomina nuda,* and I would not be surprised if they have to be withdrawn as synonyms of *Hippoporidra.* How many bryozoan-covered shells were examined is not clear from Stechow's account, and apparently only one has been figured—by Balss in 1920. The hermit crabs which inhabited the shells were *Eupagurus pollicaris* Say, *alcocki* Balss and *Diogenes pugilator* Roux, and of both there were

several specimens available from the locality where the bryozoans were taken (off Kongo River, 44 meters depth). Both species of hermit crabs are widespread species and also listed from the western Atlantic.

The present shells covered by *H. edax* measure from 8.2 to 12.5 cm. from tip to tip of the horns; thus they are much longer than those figured by Canu and Bassler; the diameter of the disk-shaped shell is about 2.2–2.8 cm., and the long diameter of the oval mouth opening ranges from 0.6 to 0.9 cm. In some cases the tips of the horns are broken and in two instances accessory branches are present on the horns. The horns are so placed that they evidently balance the shell; where one horn is longer the other is somewhat stouter.

In the small *calcarea* shell the total distance from tip to tip must have been about 4 cm.; both horns are broken so the actual length is 3.5 cm. from tip to tip; likewise the shorter horns forming the coxcomb are partly broken. Also in this case the various projections balance the shell and interestingly enough exactly the same arrangement of the horns is found in shells overgrown by a calcareous hydrozoan, *Janaria mirabilis* Stechow, inhabited by *Eupagurus varians* Benedict and known from about 10 fathoms depth along the western coast of Mexico.

Of the three specimens of *Pylopagurus ungulatus* taken in the West Indies, two came from Florida and one from off Yucatan, the same localities from which shells covered by *H. edax* have been taken; one was in a sponge incrusted shell, the two others presumably uncovered. In the present specimen, a male, the total length from tip of the large claw to tail end is 4.3 cm., the carapace is 0.9 cm. long, and the lid-like right claw measures 0.9 cm. in length, just the correct length to close the opening in one of the larger shells.

One somehow wonders how the rather small hermit crab is able to drag that huge shell around, even if it is well balanced and, of course, much lighter in water than in air. (Canu and Bassler mention how the small shell covered by *H. calcarea* appears to be able to float in the water.) Possibly the reason why one so rarely finds the shell inhabited is that when a certain size is attained the hermit crab leaves the shell—or it may be unusually quick to get out of its house when the dredge is hauled up.

For the person who is fortunate enough to live near the shore in Florida and has access to a dredge, the present findings offer an unusual opportunity to solve a number of ecological problems. In localities where the "Texas Longhorn Shells" are not uncommon, it should be possible to find the early stages of the shells and also, by carefully studying the broken debris in the dredge, to ascertain whether or not the bryozoans are bound to settle down on a gastropod shell. Also one might discover whether other hermit crabs than *Pylopagurus undulatus* inhabit the "Texas Longhorn shells."

Material examined:

Hippoporidra edax (Busk)

Four shells from off Wreck Buoy, Key West, Florida, 12–18 fathoms, from different type of bottom: sand, sticky marl, sand and marl.

Two from off Pelasky Light, Tortugas, Florida, 13 fathoms, sticky marl.

Two from Rebecca Shoals Light House, 16–18 fathoms—also the hermit crab.

Hippoporida calcarea (Smitt)

One from Sombrero Light, Key Vaca, Florida, 40 fathoms.

Material previously known:

Canu and Bassler report *H. edax,* from Elbow reef and off Yucatan and Florida at 21–49 fathoms depth (Pourtalès' material described by Smitt, 1873); they also list the Verrill record from Bermuda. According to the two authors the bryozoan is ovicelling in January. Of *H. calcarea* they report Osburn's material (listed as *edax*) from Tortugas in 6–15 fathoms, and a number of localities around Florida, 39–56 fathoms, partly Pourtalès' material, partly "Albatross" material; the species was observed as ovicelling in March–April. Plesiotypes of both species are in the U. S. National Museum.

References

Balss, H. 1920. Paguriden. Wissenschaftlichen Ergebnisse d. Deutschen Tiefsee Expedition (Valdivia, 1898–1899), Vol. 20,

Pt. 2, pp. 85–124 (Reprint 1–40), pls. 7–11. Description and figure of *Eupagurus pollicaris* Say, var. *alcocki* with its bryozoan incrusted shell.

——. 1924. Über Anpassungen und Symbiose der Paguriden. Eine zusammenfassende Übersicht. Zeitschr. Morphol. und Okologie der Tiere, Vol. 1, pp. 752–792. On pp. 784–785 description of symbiosis with bryozoans.

Canu, F. and Bassler, R. S. 1928. Fossil and Recent Bryozoa of the Gulf of Mexico Region. Proc. U. S. Nat. Mus., Vol. 72, Art. 14, pp. 1–199, pls. 1–34. *Hippoporidra edax* and *H. calcarea* (Family Celloporidae) are treated on pp. 138–140, pl. 22, figs. 1–6, text fig. 30.

Kirkpatrick, R. and Metzelaar, J. 1922. On an instance of Commensalism between a Hermit crab and a Polyzoan. Proc. Zool. Soc. London, 1922, pp. 983–990, pls. 1–2.

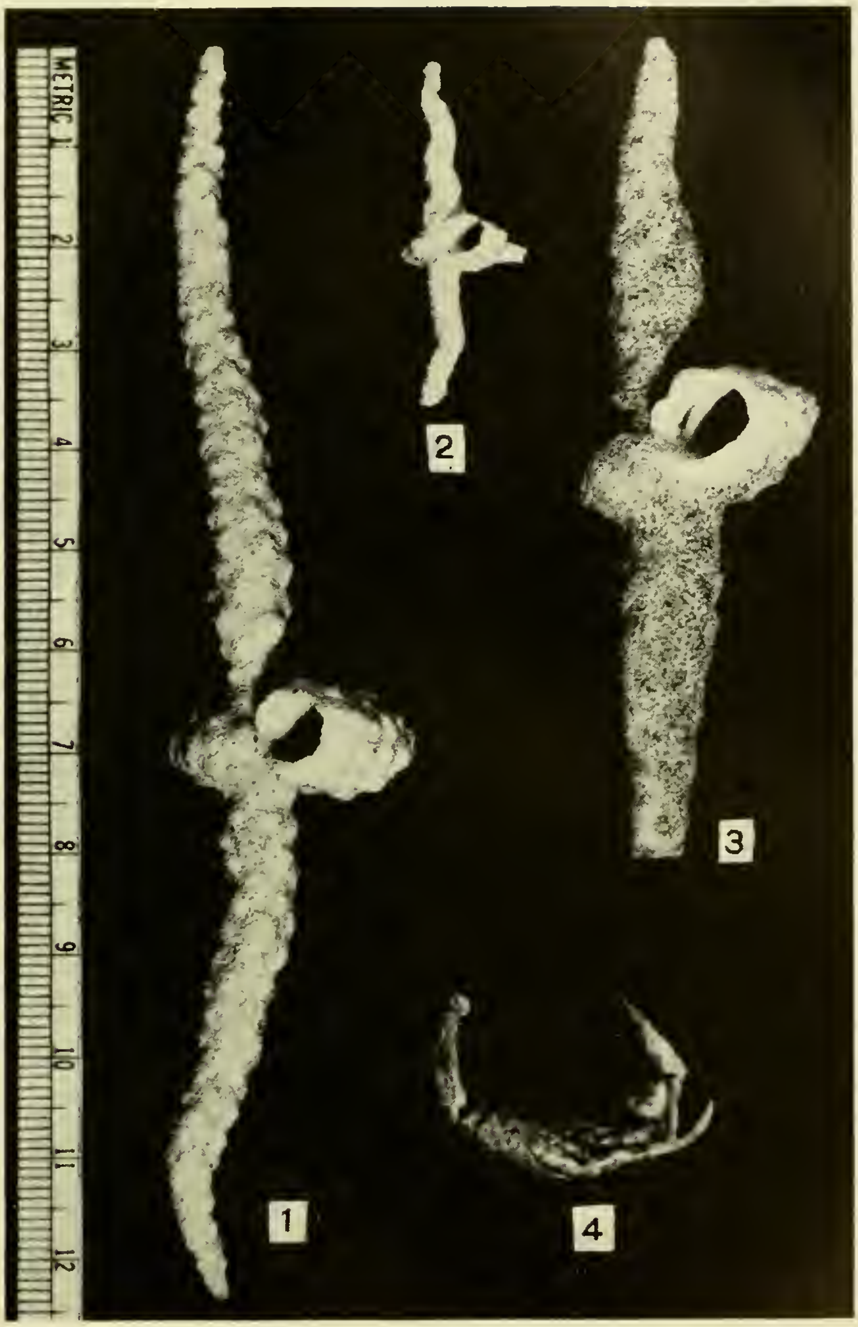
Milne Edwards, A. and Bouvier, E. L. 1893. Description des Crustaces de la famille des Paguriens. Reports on the Results of the Dredgings—Blake, no. 33. Mem. Mus. Comp. Zool., 14, No. 3, pp. 1–172, pls. 1–12. *Pylopagurus* n.g., p. 74; *P. ungulatus* (Studer), p. 80, pl. 6, figs. 15–18.

Osburn, R. C. 1914. The Bryozoa of the Tortugas Island, Florida. Carnegie Institution of Washington, D. C. Publication 182, pp. 181–222. *H. calcarea* listed as *Lepralia edax.*, from Tortugas, 13–29 meter.

Smitt, F. A. 1873. Florida Bryozoa, collected by Count L. F. de Pourtalès, 2. Kungl. Svenska Akademiens Handl. 11, no. 4, pp. 1–85, pls. 1–13. *Lepralia edax* Busk and varieties, p. 63, pl. 11, figs. 220–225.

Stechow, E. 1921. Neue Gruppen skelettbildender Hydrozoen. Verhandl. d. deutsche zool. Gesellschaft in Berlin, 26, pp. 29–31. Preliminary description of the West African bryozoan genera *Celloma* and *Keruniella* (Family Celloporidae) with their type species, still *nomina nuda.*

Verrill, A. E. 1903. Zoology of the Bermudas, Vol. 1, Art. 10, Additions to the Fauna of the Bermudas from the Yale Expedition of 1901, with notes on other species, pp. 15–62, pls. 1–9. *Leprelia edax* (Busk), p. 54. On underside of corals, shallow water. It has apparently not been verified by Canu and Bassler.



FIGS. 1, 3. Large specimens of Texas Longhorn shells, formed by the bryozooan *Hippoporidra edax* (Busk).

FIG. 2. A small Texas Longhorn shell, formed by *H. calcarea* (Smitt).

FIG. 4. Lateral view of hermit crab, *Pylopagurus ungulatus*, found in (another) shell overgrown by *H. edax*. Scale in centimeters.

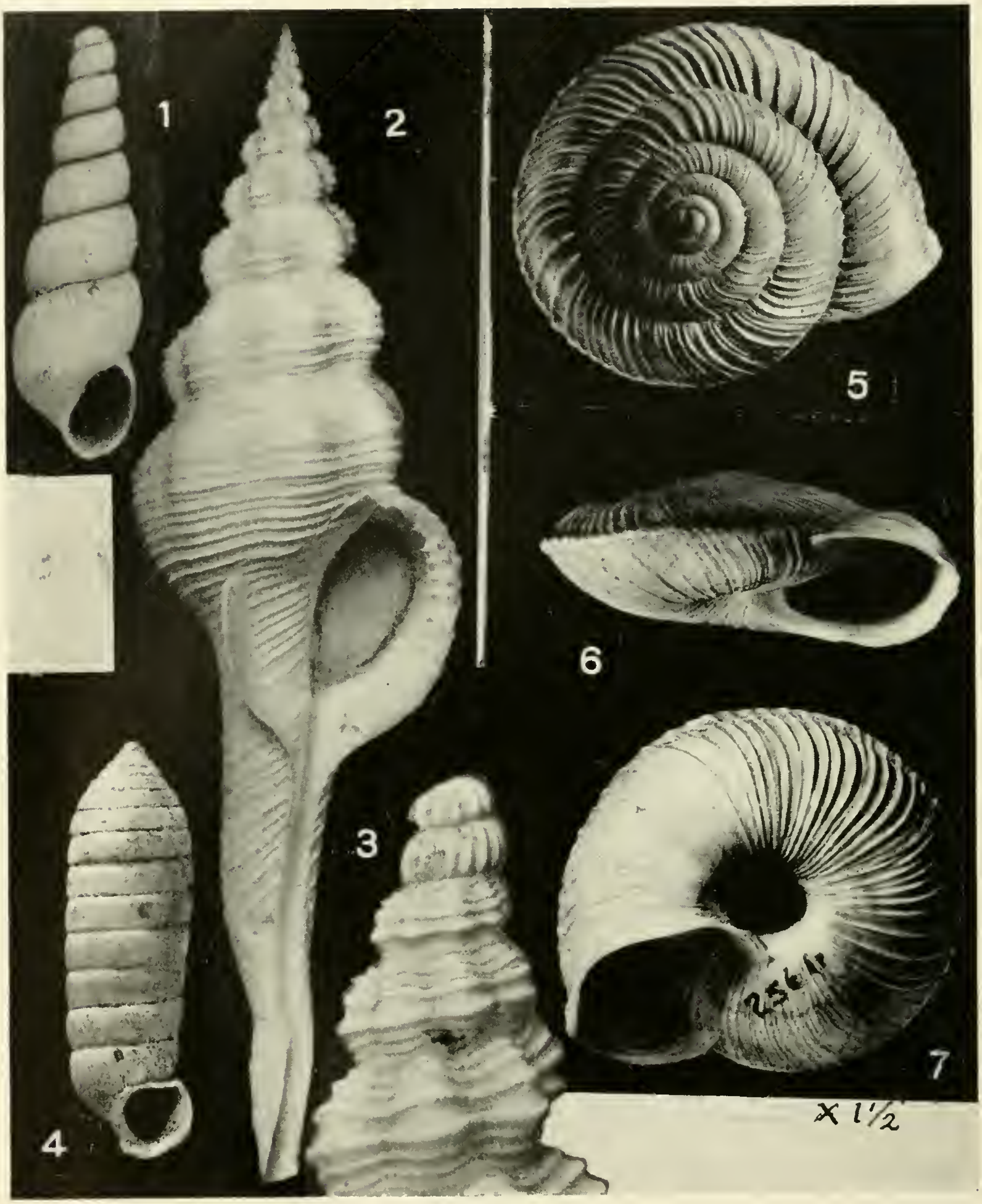


Fig. 1. *Pseudosubulina ruthae* P.

Figs. 2, 3. *Fusinus (Heilprinia) dowianus* Olsson, and apex enlarged.

Fig. 4. *Coelostemma balesi* P.

Figs. 5–7. *Monadenia circumcarinata* (Stearns) × 1½.

SOME CALIFORNIAN AND MEXICAN LAND MOLLUSKS

By H. A. Pilsbry

Pseudosubulina ruthae, new species Pl. 8, fig. 1

California: on the beach at False Bay above high tide level in drift which also contained *Truncatella* and *Assiminea.* Type and paratypes 190114 ANSP.; other paratypes in Baily Collection. Collected by Joshua L. Baily Jr. and Ruth I. Baily.

The shell is slender (the greatest diameter contained about three and one-third times in the length), regularly tapering to an obtuse, rounded apex. It is thin, corneous but becoming whitish on the spire. The surface glossy, and in places showing extremely weak folds in the direction of growth lines. These may be distinct in some adult specimens but visible with difficulty in others. The whorls are strongly convex. Aperture ovate. The columella is straight above, and rather wide and heavy, becoming narrow and concave below.

Length 5.7 mm., diameter 1.75 mm.; 7½ whorls.

The nearly smooth surface and absence of any truncation of the columella are unusual characters for this genus. It is not very similar to any Mexican species known to me. The specimens are fresh, probably alive when collected.

Dr. Baily writes that "two of my friends, Mrs. Ida Sweet and Miss Edna Wilson, got specimens from the same locality, so that I think there is no reasonable doubt that it belongs to our fauna. Unfortunately the locality has been destroyed by a real estate development."

It is named for Ruth Ingersoll Baily (Mrs. Joshua L. Baily).

Trichodiscina sinaloa, new species Text fig. 2

Mexico, state of Sinaloa: Drift debris of the Rio Fuerte, San Blas. Type 166601 ANSP. collected by Pilsbry, 1935.

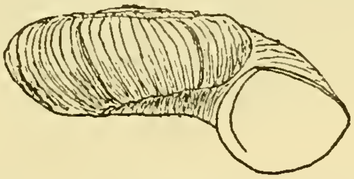


Fig. 2. *Trichodiscina sinaloa.*

The shell is discoidal with nearly flat spire, slightly and very bluntly angular periphery and convex base. Umbilicus broadly open, shallow, its width nearly half the diameter of the shell and showing about 3⅓ whorls with a deep suture. There are 3½ whorls joined by a deep suture, the first one and a half smooth, the rest with retractively radial striae, fine and close at first but rapidly becoming strong and almost lamellar, and separated by much wider intervals. The last whorl is noticeably flattened below the periphery, descends slowly to the aperture and becomes shortly free from the preceding whorl. The aperture is oblique, shortly oval, the peristome thin, expanded and continuous.

Height 3 mm., diameter 6 mm.

The last whorl shows remains of several former expanded peristomes, so that individuals which appear to be mature will be found smaller than the unique specimen serving for type.

Coelostemma balesi, new species Pl. 8, fig. 4

Mexico, State of Guerrero: kilometer 175, near Chilpancingo on the road to Acapulco. Type and paratypes 191110 ANSP., collected by Dr. B. R. Bales.

The shell is cylindric with shortly conic summit, rather thin, white. The nuclear shell of about 2⅓ whorls is slightly nipple-like, smooth. Following six whorls of the cone have slightly oblique thread-like striae about as wide as their intervals. On the cylindric part of the shell the striae become much smaller, but on the last whorl they become coarser again. The whorls are all very weakly convex. The last whorl is short, well rounded at base, and very shortly built forward in front. Umbilicus closed. The thin peristome is expanded, its parietal margin straightened. The internal axis is about two-fifths of the diameter of shell. It is slightly larger where the cylindric portion passes into the conic, and is smaller in the penult whorl. Its surface has numerous rather weak, obliquely axial threads.

Length 17.7 mm., diameter 5.4 mm.; 17⅓ whorls.

This shell resembles *C. adria* (Bartsch), but that species is smaller, has a much lower summit cone, the periphery of the last whorl is obscurely angulated and the base narrowly perforated.

THE HABITS AND OCCURRENCE OF THE NUDIBRANCH, ARMINA TIGRINA, IN SOUTHEAST UNITED STATES

By R. Tucker Abbott

Associate Curator, Division of Mollusks, United States National Museum [1]

Specimens of the nudibranch mollusk, *Armina tigrina* Rafinesque, have appeared in collections recently sent to the U. S. National Museum for identification. Because this genus has not been hitherto recorded from the east coast of North America (except for one obscure reference by K. J. Bush in Verrill 1885, p. 586), we are giving here a brief diagnosis, the synonymy, geographical records and habits of this relatively common species. *A. trigrina* is common in the Mediterranean Sea, and our American specimens show no important differences in either animal or radula characters. Although this species has not been figured in American literature, a number of illustrations, including several in color, have appeared in European works, as noted in the synonymy of the species. The most readily available figure appears in Paul Fischer's *Manuel de Conchyliologie,* 1887, p. 551, fig. 289 (as *Pleurophyllidia lineata* Otto).

Diagnosis.—Animal about 2 inches in length and 3/4 inch in width; somewhat lanceolate in shape, as seen from above; broad in front and tapering to a point posteriorly. Notum or back smoothish, brownish black in color with about 25 to 45 narrow, yellowish or whitish, longitudinal stripes. The notum overhangs the sides of the body. There is a series of 25 to 35 obliquely-arranged lamellae attached to the underside of the margins of the notum on each side of the animal. Anterior to these, there is a more compact series of short, very thin, crowded gill-lamellae. Rhinophores close together, short, cylindrical, with a laminated surface, dark-brown in color in preserved specimens and retractile. Internal buccal mass large, with strong jaws and a relatively large radula ribbon. The latter consists of 30 to 50 transverse rows of golden-brown teeth, with a large, quadrate, denticulate central tooth which is flanked on either side by 60 to 70 smaller, sickle-shaped laterals.

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Superfamily ARMINACEA

Family ARMINIDAE

Genus ARMINA Rafinesque

Armina Rafinesque 1814, Précis des Découvert. Somiologiques ou Zool. et Botaniques. Palermo, p. 30, no. 21 (see W. G. Binney and G. W. Tryon 1864, Compl. Writings of . . . Rafinesque . . .Conch., p. 12). Type by subsequent designation: *Armina tigrina* Raf. by Iredale and O'Donoghue 1923, p. 217.
Pleurophyllidia Stammer 1816, Dissert. Anatom.-Medica Observ. ex Anatomia Compar. Halae, p. 30. Type by monotypy: *Pl. undulata* Stammer = *A. tigrina* Raf.
Diphyllidia A. W. Otto 1820, Nova Acta Physico-Medica, Acad. Caesar. Leopold.-Carolin., vol. 10, pt. 1, p. 126. Type by monotypy: *D. lineata* Otto = *A. tigrina* Raf.

ARMINA TIGRINA Rafinesque

Armina tigrina Rafinesque 1814, Précis Découv. Somiol. Zool. Botan. Palermo, p. 30, no. 21 (no locality stated, but probably Sicily).
Pleurophyllidia undulata Stammer 1816, Dissert. Anat.-Med. Observ. ex Anatom. Comp., p. 30. (Neopolitano.)
Diphyllidia lineata A. W. Otto 1820, Nova Acta Physico-Medica, Acad. Caesar. Leopold.-Carolin., vol. 10, pt. 1, pp. 121–126, pl. 7, figs. 1a, b, c (in color). (Neapel.)
Pleurophyllidia cuvieri Meckel, K. J. Bush in A. E. Verrill 1885, Annual Report Comm. Fish and Fisheries for 1883 (Wash., D. C.), p. 586.
Armina tigrina Raf., Pruvot-Fol 1937, Archives du Mus. National d'Hist. Natur., series 6, vol. 14, pp. 57–59, pl. 1, fig. 1 (in color).

Anatomical details of this species are found in Bergh 1866, pp. 16–29, pl. 1, figs. 1–39; Vayssière 1901, pp. 116–121, pl. 6, figs. 16–22; Souleyet's *Voyage de La Bonite,* 1841, Atlas, pl. 24E, figs. 1–17; text pp. 455–459; Cuénot 1915, pp. 22–29; and Pruvot-Fol 1937, pp. 57–59, pl. 1, fig. 1. The latter figures and describes the egg-case as being a five-inch-long, spirally-coiled gelatinous string containing numerous, pale rose-coral eggs.

Habits.—Members of the genus *Armina* have been reported as being sand burrowers (Kelaart 1859, p. 494; Eliot 1906, p. 679; and Cuénot 1915, p. 25). In 1940, Miss E. B. Richardson of the Charleston Museum in South Carolina made notes (*in litt.*)

which we are quoting here on the habits of this species. Numerous specimens were observed on the lower reaches of the Fort Moultrie, South Carolina, beach at low tide in December 1939. "When we first got to the beach, the animals were just emerging. They occurred in a stretch of from 15 to 18 feet from the low water mark. The first sign of emergence is the rising of a small crown of sand anywhere from ¼ to ¾ of an inch across. The head appears first with the underside of the body uppermost. Where the sand is comparatively hard, the two-inch-deep holes remain, showing a diameter of ¼ to ½ inch; when in the wetter part of the beach, the holes cave in and leave little sign. The longest track we saw was about 7 feet in length. It had a decidedly corrugated appearance, and bore a trail of slime. One of the live animals that we brought back to the museum made itself into a ball, and then pushed itself head first into the sand. The body of the animal can be stretched considerably when in motion. The mantle usually hangs over and touches the foot, but now and then is restlessly undulated. The color of the living animals is bright cream with gray-black lines, although in some specimens I see an olive-green color. They are very thin, and the orange digestive organs can be seen quite plainly."

Mr. Joel Hedgpeth who has sent us specimens from the Gulf of Mexico reports (*in litt.*) that this species is common along the Texas coast just offshore.

Records.—North Carolina: 20 miles due east of Cape Hatteras, 15 fathoms. Fine sand; bottom temperature 68° F. Albatross station 2007. 1883. South Carolina: Fort Moultrie, Sullivan's Island, Charleston Co. (E. B. Richardson, 1939–40). Texas: off Port Arkansas, 20 fathoms (J. W. Hedgpeth, Jan. 25, 1946); off Port Isabel (J. W. Hedgpeth, Mar. 30, 1947). Mexico: off Puerto Obregon, Gulf of Campeche, 13 to 20 fathoms (Henry Hildebrand, August 1951).

The *Albatross* record off Cape Hatteras was included by K. J. Bush in a list of mollusks (see A. E. Verrill 1885, p. 586) as *Pleurophyllidia cuvieri* Meckel. Bush probably was referring to *Armina cuvieri* d'Orbigny 1837 which, however, appears to be another species from western South America. I have examined the *Albatross* specimen and find it is *A. tigrina* Raf.

Literature Cited

References appearing in the synonymies are not repeated here.

Bergh, R. 1866. Bidrag til en Monographi af Pleurophyllidierne. Naturhistorisk Tidsskrift (Copenhagen), 3rd series, vol. 4, pp. 1–80, 9 pls.

Bergh, R. 1890. Weitere Beiträge zur Kenntniss der Pleurophyllidien. Verhandl. der k. k. zoologisch-botanischen Gesellschaft in Wien, vol. 60, pp. 3–16, 2 pls.

Cuénot, L. 1915. Pleurophyllidiens. Bull. Station Biologique d'Arcachon (Univ. Bordeaux), vol. 16, pp. 25–36.

Iredale, T. and C. H. O'Donoghue. 1923. List of British Nudibranchiate Mollusca. Proc. Malacol. Soc. London, vol. 15, pts. 4–5, pp. 195–233 [217].

Kelaart, E. F. 1859. Descriptions of New and Little-known Species of Ceylonese Nudibranchiate Mollusks. Ann. Mag. Nat. Hist., series 3, vol. 3, pp. 291–304; 488–496 [see 494].

Ohshima, H. 1933. Young Pycnogonids found Parasitic on Nudibranchs. Annot. Zool. Japon, vol. 14, pp. 61–66.

Vayssière, A. 1901. Recherches Zool. et Anat. sur les Mollusques Opisthobranches du Golfe de Marseille (pt. 3). Annales Mus. d'Hist. Nat. Marseille, vol. 6, pp. 1–130, 7 pls.

Verrill, A. E. 1885. Results of Explorations of the Steamer *Albatross* off the Northern Coast of U. S. in 1883. Annual Report Commission Fish and Fisheries for 1883. Wash., D. C. [p. 586], pp. 506–610, 44 pls.

Von Ihering, H. 1886. Zur Kenntniss der Nudibranchien der brasilianischen Küste. Jahrbücher der Deutschen Malakozool. Gesellschaft, vol. 13, pp. 223–240, pl. 9 [*Pl. mülleri*].

A KEY TO THE HAWAIIAN CYPRAEIDAE

By JOAN DEMOND

The Cypraeidae, particularly the beautifully colored species of the Hawaiian Islands, are among the mollusks most attractive to collectors. However, to my knowledge, there is no key to these species available. Consequently, I have devised such a key in the hope that it will aid in identification.

According to Ingram (1937), 29 species of Cypraeidae are found in the waters of the Hawaiian Islands, five of which are endemic to the Hawaiian Islands. Twenty-eight of these species

are included in the key. I have excluded *C. ostergaardi* Dall, since its occurrence is so rare.

The key is based upon external characteristics of unweathered adult specimens in the collection of the University of Hawaii and specimens loaned to the University by private collectors in Honolulu.

A. Dominant dorsal ornamentation of transverse solid color bands, of a transverse mid-dorsal band of irregular color markings, of transverse raised ribs, or of irregular raised nodules . . . . B

AA. Dominant dorsal ornamentation of spots or reticulations, of thin longitudinal streaks, of dark splotches and faint transverse bands, or dorsal ornamentation essentially absent . . . . J

B. Dominant dorsal ornamentation of transverse solid color bands, of a transverse mid-dorsal band of irregular color markings, or of transverse raised ribs C

BB. Dominant dorsal ornamentation of raised nodules I

C. Transverse solid color bands or transverse raised ribs over dorsum; margins almost equally inflated . . . . D

CC. Transverse median band of brown irregular color markings over dorsum; right margin more produced than left . . . . H

D. Transverse raised ribs over dorsum and base . . . . *Cypraea childreni* Gray

DD. Transverse solid color bands over dorsum . . . . E

E. Margins very dark chocolate brown; teeth, base, and extremities of same dark brown . . . . *C. talpa* Linnaeus

EE. Margins flesh color . . . . F

F. Teeth and interstices between teeth brilliant purple . . . . *C. carneola* Linnaeus

FF. Teeth not brilliant purple . . . . G

G. Teeth deeply incised, extending over base on both sides; teeth ashen or whitish; margins not arenaceously striated . . . . *C. sulcidentata* Gray *

GG. Teeth not deeply incised nor extending over base; teeth minute, numerous, ivory white; margins arenaceously striated above . . . . *C. arenosa* Gray

* Species endemic to the Hawaiian Islands.

H. Transverse band extending over columellar (left) margin onto base; extremities brilliant purple; margins unspotted.......................... *C. fimbriata* Gmelin

HH. Transverse band not extending over margin onto base; extremities white with brown or blackish brown spots .... *C. teres* Gmelin

I. Extremities produced and beaked; shell grayish with pale rust-colored nodules and ridges................ .... *C. nucleus* Linnaeus

II. Extremities not produced or beaked; shell and nodules pinkish or white.......... *C. madagascarensis* Gmelin *

J. Dominant dorsal ornamentation of thin brown or blackish brown longitudinal streaks; extremities dark brown or orange...................... *C. isabella* Linnaeus

JJ. Dominant dorsal ornamentation of spots, splotches, or reticulations, or dorsal ornamentation absent........K

K. Dorsal ornamentation essentially absent; margins and extremities thickened, often somewhat irregularly tubercled; dorsum yellow-orange to greenish yellow; shallow groove setting dorsum off from margins.......... .... *C. moneta* Linnaeus

KK. Dorsal ornamentation of spots, splotches, or reticulations L

L. Dorsum white or very light brown, greatly elevated and rounded; length 11 to 19 mm.......................M

LL. Not so.......................................N

M. Numerous light brown rings over dorsum; extremities slightly produced.................. *C. annulata* Gray

MM. No such rings over dorsum, but few scattered brown spots present on dorsum; extremities extremely produced and beaked..................... *C. cicercula* Linnaeus

N. Four large, brown, squarish blotches on dorsum, two on either side of midline; three light brown transverse bands over dorsum (in unworn specimens); margins and extremities produced.......... *C. tessellata* Swainson *

NN. Numerous spots or reticulations over dorsum.........O

O. Margins pitted................................P

OO. Margins not pitted.............................S

P. Extremities brilliant to pale purple...............Q

PP. Extremities white or fleshy orange................R

Q. Margins and base purplish; numerous irregular white spots over brownish dorsum........*C. poraria* Linnaeus

QQ. Margins and base fleshy orange; brown and white spots over bluish gray dorsum...........*C. helvola* Linnaeus

R. A large, squarish, purple-brown spot over the middle of each margin; margins produced......*C. erosa* Linnaeus

RR. Such single marginal spots absent; margins not produced; definitely defined white spots over chestnut brown dorsum; extremities and teeth fleshy orange...*C. semiplota* Mighels *

S. One or both margins considerably produced..........T

SS. Neither margin considerably produced..............W

T. Teeth white....................................U

TT. Teeth brown; large blackish brown splotch on columellar side of base......................*C. reticulata* Martyn

U. Interstices between teeth orange; margins white with purple dots.........................*C. cruenta* Gmelin

UU. Interstices white...............................V

V. Light spots on brownish dorsum; deep brown or blackish brown spots on white margins; only right margin produced............................*C. gaskoini* Reeve

VV. Brownish spots on whitish dorsum, extending slightly onto margins; both margins produced...*C. rashleighana* Melvill

W. Margins angular................................X

WW. Margins rounded................................Y

X. Teeth dark reddish brown with white interstices; extremities considerably produced; length 40 to 96 mm............................*C. mauritiana* Linnaeus

XX. Teeth white; extremities not considerably produced; length 17 to 37 mm.........*C. caputserpentis* Linnaeus

Y. Teeth dark brown.................*C. scurra* Chemnitz

YY. Teeth white or whitish............................Z

Z. Interstices between teeth orange......*C. lynx* Linnaeus

ZZ. Interstices between teeth white or flesh color........A′

A′. White spots on brown dorsum; arenaceous striations on margins; average size 25 to 35 mm in length...*C. vitellus* Linnaeus

A′A′. Brown or brownish black spots on whitish dorsum; arenaceous striations on margins absent or very faint; average size 100 mm or more in length...*C. tigris* Linnaeus

LITERATURE CITED

1. INGRAM, W. M., The family Cypraeidae in the Hawaiian Islands, Nautilus 50(3) : 77–82, 1937.
2. INGRAM, W. M., Endemic Hawaiian cowries, B. P. Bishop Mus., Occ. Papers, 14(19) : 327–333, 1939.
3. INGRAM, W. M., Hawaiian Cypraeidae, B. P. Bishop Mus., Occ. Papers, 19(1) : 1–23, 1947.

THE SNAILS FROM TWO INDIAN SHELLMOUNDS NEAR CLARKSVILLE, VIRGINIA

BY LESLIE HUBRICHT

In the vicinity of Clarksville, Virginia, on the land now inundated by Buggs Island Lake, were two Indian shell mounds. The first of these was located on the north bank of Roanoke (Staunton) River, northwest of Clarksville. The second site was on Occoneechi Island on the north bank of Dan River, northwest of Clarksville. In addition to large numbers of shells of the mussel, *Elliptio complanatus* (Solander), these mounds contained numerous snail shells, some species of which are no longer found living in this region today. The aquatic species, as indicated by their abundance, must have been collected locally for food. The land snails were probably attracted by the lime and lived on the mounds.

The first site contained no land snails, but contained large numbers of the following species of aquatic snails. The Pleuroceridae were determined by Mr. Calvin Goodrich.

Campeloma decisum (Say). This species is not known at present from either the Roanoke or Dan River proper. It is found in Wimbish Lake, a slough of the Dan River, west of Schoolfield, Pittsylvania Co., Virginia.

Lioplax subcarinata (Say). The nearest known locality for this species is in the Tar River, south of Spring Hope, Nash Co., North Carolina.

Nitocris carinatus (Brug.). The majority of the specimens found in this mound were of the multicarinate form. This species occurs in the Roanoke River in the vicinity of Lafayette,

Montgomery Co., Virginia, and at Staunton River State Park, Halifax Co., but is not known from between these two localities. At both of these localities the multicarinate form predominates. In the Dan River it is abundant at Meadows of Dan and near Kibler, and the specimens are quite large. Below Kibler they become very depauperate, and before the Dan crosses the North Carolina line they disappear completely, and are not known from below this point at the present time. Only the smooth form is known from the Dan River. The smooth form is also known from many tributary streams of the Dan and Roanoke Rivers.

Goniobasis virginica (Say). Only the smooth form was found in the mounds. The nearest known locality for this species is in the Tar River, near Spring Hope, Nash Co., North Carolina.

Goniobasis catenaria catenaria (Say). The nearest known locality for this species is in the Haw and Rocky Rivers, near Pittsboro, Chatham Co., North Carolina.

Goniobasis catenaria dislocata (Ravenel). The presence of this subspecies associated with the typical form without intergradation suggests that it may be a distinct species. Its nearest known locality is in the Eno River, Durham Co., North Carolina.

At the second site, the same aquatic species occurred, but they were not common. *Nitocris carinatus* (Brug.) occurred only in the smooth form. Shells of land snails were abundant. Of the land snails found in the mound, the following species are found living in the vicinity. *Stenotrema barbatum* (Clapp), *Mesodon thyroidus* (Say), *M. appressus* f. *sculptior* (Chadwick), *Triodopsis juxtidens* (Pils.), *T. fallax* (Say), *T. albolabris* (Say), *Haplotrema concavum* (Say), *Mesomphix rugeli oxycoccus* (Van.), *Ventridens ligerus* (Say), *Zonitoides arboreus* (Say), *Anguispira alternata* f. *angulata* Pils., *A. fergusoni* (Bland), and *Gastrocopta contracta* (Say).

The following four species of land snails are no longer found living in the vicinity of the mound.

Triodopsis vulgata Pils. Not known living east of the Blue Ridge Mountains.

Allogona profunda (Say). The nearest known locality for this species is in the Smith Mt. Gorge, Pittsylvania Co., Virginia.

Mesomphix capnodes (W.G.B.). This species is found living

on the bluff along the Roanoke River as far east as Hurt, Pittsylvania Co., Virginia.

Anguispira knoxensis (Pils.). More than fifty specimens of this species were collected in the mound. Its nearest known locality is on Pine Mountain, Harlan Co., Kentucky.

NOTES ON THE GASTROPODS COLLECTED IN THE VICINITY OF CRISFIELD, MARYLAND

By J. FRANCES ALLEN

Department of Zoology, University of Maryland

During recent ecological investigations being undertaken in the vicinity of Crisfield, Maryland, the opportunity presented itself for the collection of the molluscan fauna of the area. Since little is known of the mollusks of this region, this paper is concerned with the occurrence and distribution of the gastropods in this locality.

Appreciation is expressed to Dr. J. P. E. Morrison, Associate Curator, Division of Mollusks, United States National Museum, for his assistance with the identification of these forms.

Crisfield is located on the eastern shore of Maryland on the Little Annemessex River, adjacent to Tangier Sound of Chesapeake Bay. Much of the area is marshland which supports typical vegetation, *Spartina alterniflora,* the cord grass; *S. patens,* the marsh grass; and *Ioa vitrea,* the marsh willow or water bush. The shore line, exclusive of marshland, varies in topography from beaches to banks. The beaches consist of sand or mud, or a mixture of both, with the bottom becoming increasingly muddy as one approaches the subtidal stratum. This type of mud-sand substrate supports a considerable amount of vegetation extending for a distance of several hundred feet from shore. Since this is an estuarian body of water with a fluctuating salinity, both salt and freshwater forms are common. *Ruppia maritima* (Linn.), the wigeon grass, and *Zannichellia palustris* (Linn.), the horned pondweed, are the two most abundant species of submerged vegetation present. *Ulva,* in general, is also quite

common. *S. alterniflora* grows from within the level of the lowest neap tides to a point reached by the high tide. The mud banks support an extensive population of the ribbed mussel, *Volsella demissus* (Dillwyn), which is embedded around and attached to the roots of *S. alterniflora* so that these two forms make up a part of the bank itself. *S. patens* grows higher up on the banks and above *S. alterniflora,* with *Ioa vitrea* forming a well-defined boundary line between the two species. The entire shore line of the Little Annemessex adjacent to Crisfield, including the marshland beyond the high tide level, was examined as well as was the shore line of the cove formed by Jenkin's Creek.

Eight families of gastropods including ten genera have been found in the vicinity of Crisfield. These same areas were visited for five consecutive years and whenever possible specimens were collected.

The family Ellobiidae is represented by two species, *Melampus bidentatus lineatus* (Say) and *Phytia myosotis marylandica* Pils. The former species occurs in greatest abundance a little above the mean high tide mark. *Melampus* is found on the surface of the ground during the winter, thus differing in its habits from those on the western shore of the Bay where it finds some protective shelter. *Phytia myosotis marylandica* was collected from a boat slip, known locally as Carson's Slip, where they were embedded in the wooden bulwark and on an algae covered area immediately above the high tide line. In an area bounded by Jenkin's Creek, they were present in large numbers on the ground under wood and debris and inside decomposed driftwood well above the normal high tide level.

Littorina irrorata (Say) of the Littorinidae is extremely abundant in the entire area where it is present at the base of *Spartina alterniflora.* Many of these periwinkles remain completely submerged; they are, however, more numerous on the banks. This species occurs in association with *Melampus bidentatus lineatus* and inhabits the shore line in all of the areas examined. *L. irrorata* also differs in its habits in this locality in that it is present on the surface of the ground during the winter and does not burrow in the mud as in some areas of the western shore.

Two specimens of *Odostomia bisuturalis* (Say) of the family Pyramidellidae were collected from the vegetation brought in

with a haul seine from approximately 150 feet offshore from the McCready Memorial Hospital which is located at the junction of the Little Annemessex River and the Annemessex Canal. This is the only area examined in which this species was found to occur. Since in the same collection, over 1200 specimens of *Bittium varium* Pfr. were taken, this is a good indication that *O. bisuturalis* is not common in this particular region.

Only a single species, the slipper limpet, *Crepidula convexa* Say, representing the Calyptraeidae was collected. It was found abundantly and distributed indiscriminately on all species of submerged vegetation.

Syncera modesta (H. C. Lea) was the only member of the Synceratidae observed. It was found in small numbers with *Phytia myosotis marylandica* on the sea wall at Carson's Slip and in considerable number with the same species on and in wood above the high tide line. *S. modesta* is also found on the submerged vegetation, apparently surviving satisfactorily in both types of habitats.

It appears that the most abundant of the snails occurring on submerged vegetation is *Bittium varium*, Pfr. of the Cerithiidae. This species was found in all the areas investigated, on all submerged vegetation including *Ulva*.

The family Nassidae is represented by two species *Ilyanassa obsoleta* (Say) and *Nassarius trivittatus* (Say). The former is extremely abundant on mud flats and can readily be observed at low tide. *Nassarius trivittatus* was collected on a sandy beach at one locality and a number of empty shells were collected along the shore of the cove of Jenkin's Creek.

Specimens of the genus *Littoridinops* of the family Hydrobiidae were retained by Dr. Morrison for future identification to species.

NON-MARINE MOLLUSKS FROM THE PACIFIC SLOPE OF NORTH AMERICA

By F. HAAS

During the Zoological Field Trip to the Northwest in 1953 for Chicago Natural History Museum, I had opportunities to

collect land and freshwater mollusks at various localities, none of which seems to have been well covered by previous collectors.

Nanaimo and vicinity, Vancouver Id., B. C., Canada

Monadenia fidelis fidelis Gray. The typical form, from Dodds Narrows, August 22, 1953.

Haplotrema (Proselenites) vancouverense Lea. Dodds Narrows, August 22, 1953.

Hippeutis (Menetus) opercularis planulatus Cooper. In a little creek emptying into Lake Hoggan, Gabriola Id. near Nanaimo, August 16, 1953.

Physa (Physa) gyrina hildrethiana Lea. Same locality and date.

Pisidium occidentale Newcomb. Same locality and date. My specimens seem to correspond well with Newcomb's description of this never figured species, which seems to be closely related to **Pisidium abditum** Haldeman.

Rogue River at Grants Pass, Josephine Co., Oregon

Lanx (Lanx) subrotundatus Baird. Very plentiful. September 8, 1953.

Goniobasis draytonii Lea. Very plentiful. Same date.

Margaritifera (Margaritifera) margaritifera Linnaeus. Rather scarce. Same date.

Gonidea angulata Lea. One single specimen. First report in the Rogue River. Same date. Jedediah Smith State Park, and vicinity, Del Norte Co., California.

Monadenia fidelis fidelis Gray. Jedediah Smith State Park, Sept. 4, 1953. Evergreen Glade Courts in Hiouchi Flats, September 2, 1953. Redwoods west of Hiouchi Bridge, September 5, 1953.

Trilobopsis loricata nortensis Berry. Redwoods west of Hiouchi Bridge, September 5, 1953; two specimens. Apparently the first record since the original description in 1933.

Vespericola megasoma Dall. Evergreen Glade Courts in Hiouchi Flats, September 2, 1953. Hill north of Hiouchi Flats, September 7, 1953.

Haplotrema (Proselenites) vancouverense Lea. Redwoods west of Hiouchi Bridge, September 5, 1953. Evergreen Glade Courts in Hiouchi Flats, September 2, 1953.

Lanx (Lanx) subrotundatus Baird. Smith River in Jedediah Smith State Park, September 2, 1953. Mill Creek in Jedediah Smith State Park, September 3, 1953.

Goniobasis draytonii Lea. Smith River in Jedediah Smith State Park, September 2, 1953. Mill Creek in Jedediah Smith State Park, September 3, 1953.

Margaritifera (Margaritifera) margaritifera Linnaeus. Mill Creek in Jedediah Smith State Park, September 3, 1953. Not found in Smith River except immediately below the mouth of Mill Creek and only in the water of the latter, before its mixing with that of Smith River.

Pisidium variabile Prime. Creek in the Redwoods west of Hiouchi Bridge, close to its mouth into Smith River; September 5, 1953.

Korbel, Humboldt Co., California

Monadenia fidelis pronotis Berry. One young specimen from the valley behind the schoolhouse, September 15, 1953; I cannot be entirely sure of this identification.

Helminthoglypta (Helminthoglypta) arrosa marinensis Pilsbry. One specimen from a clearing, about one mile north of Korbel, September 15, 1953; apparently the northernmost record of this subspecies.

Vespericola megasoma Dall. From various localities around Korbel, September 10–15, 1953. The parietal tooth of the shell is well represented in the majority, entirely absent only in a few of the specimens.

Haplotrema (Proselenites) vancouverense Lea. From various localities around Korbel, September 10–15, 1953.

Haplotrema (Ancotrema) sportella Gould. From four localities around Korbel, September 10–15, 1953. All specimens heavily granularly striate.

Gyraulus (Gyraulus) hirsutus Gould. Two specimens from a creek in the woods, September 11, 1953; both of them quite typical.

Goniobasis draytonii Lea. Could not be found in the Mad River, but discovered in one of the headwater creeks of the North Fork of the Mad River.

PISIDIUM SPECIES AND SYNONYMS, NORTH AMERICA, NORTH OF MEXICO

By H. B. HERRINGTON

The purpose of this paper is to present a revised list of the species of *Pisidium* of the family Sphaeriidae (finger nail clams). The writer also gives some reasons for revising the taxonomy of the Sphaeriidae, and makes some comments.

The genus *Pisidium* is distinguished from other members of this family by the beaks being subcentral to far back, and being on the posterior side of center. (In *Sphaerium* they are on the anterior side of center.)

Pisidium is found over a large part of the world. The writer has specimens of *Pisidium conventus* Clessin and *P. idahoense* Roper from Great Bear Lake, North West Territories, Canada, and Odhner (1921: 3) reports *conventus* from about 73° 15′ N. Lat. in Novaya Zemblya. Several species of *Pisidium* are circumpolar, and *P. casertanum* (Poli) is also found in Africa, New Zealand and Australia.

On this continent the process of setting up new species by conchologists went on for more than a century. In some cases duplicate names arose because the author did not have access to the descriptions made by other conchologists. In other cases species were named on too little degree of variation. And this went on and on until my index shows over one hundred described species for North America, besides MS. and label names.

Mr. B. B. Woodward (1913) made a revision of the British *Pisidium* and gave a new impetus to the study of these little clams in the Old Land. Very little revision has been undertaken on this continent since the days of Temple Prime (1865); Dr. Victor Sterki was more interested in adding new descriptions.

In approaching the study of *Pisidium,* with a view of revising the names, the student must face the question, Are we dealing with groups of species, or with species that have a considerable degree of variation? If we proceed on the second assumption we will come out pretty much as I have set down below. If we accept the first I see no end to the number of species. Dr. V. Sterki having accepted the first, what else could he do but go on multiplying descriptions? What else could anyone do?

The unsoundness of Sterki's method of using variation in outline of shell as the chief character in constituting species, is to be seen in the names he gave to some of his 'species.' Having concluded that these were but groups of species and that species have to do with but degrees of difference he proceeded to set up his 'species.' But, now and again, he received specimens that intergraded a bit with more than one of his 'species,' but were exactly like none he had already named. These 'gave him a headache.' They vexed his soul, as is indicated by some of the names he gave to these intermediates—*vexum, fraudulentum, probum, paradoxum, proximum,* and *depressum* (a label name).

It seems to this author that to be a valid species the specimens must be sufficiently different from all other species to permit the distinguishing characters to be written down in such a way that other students in this field can recognize the species. The distinguishing characters must not be simply more or less, but the specimens must have some character, or characters, that do not intergrade with any marginal form of some other species. That is to say the difference we require, before we acknowledge that such and such specimens constitute a species, must not be so slight that other specimens are left, suspended 'in the air' as it were, with such statements on the labels as 'near,' 'somewhat like,' or 'perhaps' and so not definitely belonging to any species.

The list of species and synonyms below is based on the morphology of the shell. The writer has endeavored to make use of all the distinguishing characters he could find. A study of the soft parts of the animal is only beginning on this continent. Dr. Nils Hj. Odhner, Stockholm, Sweden, has made such a study of some of the Eurasian species, some of which are common to both hemispheres. It is possible that an examination of the soft parts of the North American Pisidia may lead to some modification of the conclusions here set down.

This paper is based on the study of a great many specimens. The writer has had almost the entire collection of Sphaeriidae of the Royal Ontario Museum of Zoology and Palaeontology, Toronto, for more than twelve years; samples of Sterki's collection from Carnegie Museum, Pittsburgh, Pa., on a long term loan; and loans from the Museum of Comparative Zoology, Cambridge, Mass., from the Academy of Natural Sciences, Philadel-

phia, Pa., and from the Museum of Zoology, Ann Arbor, Mich. Besides this he has around 4,000 lots, of his own collecting or samples taken from specimens sent in for determination from various parts of Canada and the United States. A number of lots of my own collecting have from 1,000 to 5,000 or more specimens. In all I have some 75,000 to 100,000 specimens in my own collection. I also have hundreds of lots of Eurasian specimens obtained by exchange, together with the handsome gift from Mr. A. W. Stelfox, Dublin, Eire, of his whole collection—2,375 lots. Then I was privileged to spend a week studying Sterki's collection at Carnegie Museum, ten days with Prime's collection at the Museum of Comparative Zoology, and a month at the British Museum (Natural History) London. Most of my North American specimens I have worked over several times.

As a help in arriving at what should be regarded as belonging to a species, I would study the specimens of a species common to North America and Eurasia, and then send large samples to one or more of the following for their judgment: Mr. A. W. Stelfox, Dublin, Mr. J. G. J. Kuiper, The Hague, Netherlands, Dr. Jules Favre, Geneva, Switzerland, and Dr. Nils Hj. Odhner, Stockholm, Sweden. Of course I take full responsibility for the list of species as here set down.

Seemingly a consideration of interbreeding as a factor in determining whether specimens belong to the same species is excluded in the study of *Pisidium*. Dr. Odhner points out (1951: 27–28) that *Pisidium conventus* Clessin is 'autogamic.' He received some live specimens of *conventus* from Mr. A. W. Stelfox, Dublin, put isolated specimens in aquaria and kept watch over them. When a young was expelled from the parent he put it in an aquarium by itself. He continued to do this until the third generation, at least, and the isolated specimens went on producing young. It may be that all *Pisidium,* or even all Sphaeriidae, are autogamic. If this proves to be the case the explanation of their spread is simplified a bit—two specimens of the same species are not required to be left in a suitable habitat to start a colony; a single specimen is all that is needed.

It must be borne in mind that there is considerable variation among the specimens of a large collection from any station. Fine details of description, such as that made by B. B. Woodward in his Catalogue (1913), are of little use in actual practice.

There is variation in shell outline, in degree of inflation, and in shape of every hinge character. But there are certain general characters, taken in the large, that separate one species from another. I would suggest to the learner that he secure specimens representative of the usual run of each species—not necessarily like the type, for the type may have been an unusual form—and familiarize himself with these. Then he can work out toward the unusual forms. One can readily learn to distinguish the usual run of each species, but to determine some of the forms requires long familiarity with *Pisidium* through handling thousands of specimens.

In *Pisidium* the beaks vary from broad to narrow and from low to high; however, they are mostly neatly rounded. But in most species there is some departure from this and in others a great deal of departure. For instance some specimens are more or less flattened on top, and in other species this departure from the usual even develops into ridges. But in most, if not all, of these species that have ridges on the beaks there are some specimens that have the ridges but little developed or entirely absent. Habitat seems to have something to do with this. In the case of *ferrugineum* Prime the explanation of the tubercular beaks, in their varying degree of development, seems to be that it is related to the same growth process that produces the ridges on the beaks of the other species of this genus. I have specimens of this species (P–1001. Birdsall beach, Rice Lake, Peterborough County, Ontario) that have the beaks in varying stages of development. Some specimens have beaks high and rounded on top, some with beaks high and flattened on top; this flattening carrying the beaks straight up produces the usual tubercular beaks; and others are high and flattened and the top, near the outer edge, is depressed, forming a wrinkle—the beginning of a ridge. Sterki rightly pointed out (1916: 450) that the ridge is not a growth—an appendicule—but a wrinkle which may be seen on the inside of the shell in young specimens. This wrinkle is conspicuous on the inside of these *ferrugineum*.

It should also be born in mind that the kind of habitat affects the degree of gloss or dullness of a specimen. There is the border of toleration, on each side, which a species can endure. Beyond that border you do not find it. Specimens coming from these two extreme borders will have some difference in appearance.

For example. I have collected *P. adamsi* Prime, form *affine* Sterki, in rotting wood and vegetable matter at the mouth of a swamp creek. I have collected it also among live vegetation where fine sand is beginning to pass over into coarse. Specimens from the rotting vegetation are very dull and bleached. From the other station they are approaching a gloss and are dark with a bluish cast. Habitat also affects shape, heft of shell, degree of striation, etc.

Great difficulty was experienced by the author in trying to determine what Sterki had in mind when he described some of his small species. His descriptions are not always too clear. Besides, I frequently found the samples of his small species in the museums mixed with infants of other species. Take the case of *P. abyssorum* (Stimpson) Sterki as an example. In the original loan to me from Carnegie Museum (Sterki's collection) one lot contained five different species. On March 12, 1952, I wrote to Carnegie Museum for samples of 63 species about which I still had some doubt. On March 20 they sent me 46 species stating that this was all they could find in Sterki's collection. *P. abyssorum* was not among them. Then I wrote to the Museum of Zoology, Ann Arbor, for such species as I still needed. They also did their best (I still am unable to find specimens to match some of Sterki's names). Among their shipment were eight lots marked *abyssorum*. These also were badly mixed. But as most of the lots came from Lake Michigan—the type locality—and most contained *P. conventus* Clessin, and as there were no other specimens that did not belong to one of the recognized species, and as *conventus* best fits Sterki's description of *abyssorum* I have listed it as a synonym of *conventus* Clessin. Evidently Sterki never saw named specimens of *conventus*. (It is only found in water that does not get warm.) Sterki found some without knowing what he had. Some specimens he called 'levissimum (?),' and some (9778) he named *hendersoni*. The difficulty I had with *abyssorum* I also had with *ohioense* and, in a lesser degree, with some others.

The only lot marked *P. paradoxum* Sterki I have seen contains but 3 *casertanum* (Poli)and 5 *lilljeborgi* Clessin. So I do not know where to place *paradoxum* Sterki.

The one lot of *P. angelicum* Rowell (3840) from Sterki's collection was marked genuine specimens from type locality. It

was also marked not *Pisidium* but crustaceans. I agree that they are not *Pisidium*.

It is interesting to find that of our twenty-five North American species twelve of them—*punctatum, lilljeborgi, obtusale, supinum, subtruncatum, ferrugineum, milium, henslowanum, conventus, nitidum, casertanum,* and *amnicum*—are circumpolar; eight—*insigne, adamsi, aequilaterale, fallax, compressum, mainense, walkeri, variabile,* and *idahoense*—are common to Canada and U. S. A., but are not found in Eurasia; and three—*cruciatum, singleyi,* and *ultramontanum*—are secured in U. S. A. but not in Canada or Eurasia. Only *amnicum* (Müller) is looked upon as a recent introduction into North America. The writer knows of only five species in Eurasia, north of the Himalaya Mts., not found in North America, and one of these—*astartoides* Sandberger—is fossil.

When we take up the matter of the degree of similarity of specimens of a species, on the two sides of the Atlantic, one finds that in some sets from one side of the ocean the specimens are so like specimens from the other side that if the two lots were mixed it would be difficult, if not impossible, to separate them. But there are also differences that are of the nature of forms or varieties. Then, too, there are certain general differencs. Thus, on the whole, specimens of the same species are more inflated and less heavily striated in North America than in Eurasia—but individual lots are found that are much the same in degree of inflation and striation.

When we keep in mind that Sterki, on the basis of a small degree of variation, divided some species up into several 'species' it can easily be seen that most of his subspecies, varieties and forms are based on distinctions so finely drawn as to be of little practical value; hence I usually ignore them. A study should be made of the 'species' I have listed below as synonyms to determine which would be of value if retained as forms. The forms I usually make use of I am listing with the species.

These little clams have an important economic value as food for waterfowl, for small bottom feeding fish—which, in turn, become food for larger fish—and as food for large bottom feeding fish like sturgeon and whitefish (Herrington 1950:28–29). But they also sometimes act as host for injurious parasites.

Mr. B. Prashad points out (1925:407) that both Dr. Nils Hj.

Odhner and Mr. A. W. Stelfox independently discovered that the shell of *Pisidium* is porous, not hairy, and that the so-called hairs are but prolongations from the epithelium which penetrate the calcareous part of the shell but not the periostracum.

We know that some species can survive for a long time without water. I have found live specimens of *casertanum* (Poli) several months after the swamps and swamp creeks in which they lived had dried up. When the wet season returns they open their valves and begin their normal activities.

I have been unable to detect any geographical subspecies, with the possible exception of *P. obtusale* C. Pfeiffer v. *lapponicum* Clessin (5 lots with a total of 8 4/2 specimens), which, in North America, I have found only in association with the cold climate of the far north.

I owe thanks to the following:

To Dr. John Oughton, without whom this study would not have been undertaken. He has patiently coached me all along in my studies and publication of papers.

To Mr. J. R. Dymond for the loan of Sphaeriidae, microscopic equipment, for vials, etc., from the Royal Ontario Museum of Zoology (and now Palaeontology). And for a grant from the Museum enabling me to visit the Museum of Comparative Zoology, Cambridge, Mass.

To the National Research Council of Canada for a grant enabling me to visit Carnegie Museum, Pittsburgh, Pa.

To Mr. A. W. Stelfox, Dublin, Eire, for loans, and then for giving me his whole collection.

To Dr. Henry van der Schalie and the Museum of Zoology, Ann Arbor, Mich., for a grant making possible a visit to Mr. Stelfox to pick up this collection and to spend a month studying the Sphaeriidae in the British Museum (Natural History). And for loans of specimens.

To the Museum of Comparative Zoology, Cambridge, Mass., the Academy of Natural Sciences, Philadelphia, Pa., and to Carnegie Museum, Pittsburgh, Pa., for loans of specimens.

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Dr. Nils Hj. Odhner, Stockholm, Sweden, for examining specimens and other courtesies.

(To be continued)

NOTES AND NEWS

The 1954 annual meeting of the American Malacological Union will take place August 16–19 at the University of New Hampshire, Durham, N. H. Detailed information will be sent to members.

PUBLICATIONS RECEIVED

The Veronicellidae of Africa. By Lothar Forcart. Ann. Mus. Roy. Belg., Sci. Zool., vol. 23, 110 pp., 5 pls., 1953.—*Hoffmannia, Congoveronicella* (both new) and *Vaginina* are included as subgenera in *Pseudoveronicella,* in which 7 species (also 1 in *Laevicaulis*) and 1 subspecies are described as new. The treatment of the penial apparatus is excellent. But unfortunately the spermatheca is neglected; from earlier accounts of this, *Eleutherocaulis* (''*Laevicaulis*'')[1] seems a subgenus of *Filicaulis,* while *Flagellicaulis* (included in *Filicaulis*) apparently belongs to *Imerinia.* Discussions of distribution, with 13 maps of the African mainland, add to the interest. Since printed in English, the errors in spelling are really surprisingly few, but ''sheat,'' consistently used for sheath, should be mentioned. ''*Vaginula*'' for *Vanigula* (p. 98) shows the danger of names too similar; a typesetter once changed all my *Vaginulus*-like usages in the same way.—H. B. B.

A historical review of the mollusks of linnaeus. Part 2. The class Cephalopoda and the genera *Conus* and *Cypraea* in the class Gastropoda. By Henry Dodge. Bull. Amer. Mus. Nat. Hist., vol. 103, art. 1, 134 pp., 1953.—This continuation discusses 92 species in four Linnean genera: *Argonauta* and *Nautilus* in addition to the two mentioned in the title. The studies are made with great care, although perhaps, in *Cypraea,* the Schilders seem somewhat overweighted.—H. B. B.

[1] Because, as shown on p. 12, Simroth himself (1913) made *Laevicaulis* a subgenus (i.e., a subjective synonym) of his genus *Eleutherocaulis,* must not the latter have precedence? The same holds for *Desmocaulis* vs. *Curticaulis.*

The Nautilus

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A NEW HEILPRINIA FROM THE GULF OF MEXICO

By A. A. OLSSON

Heilprinia was proposed by Grabau in 1904 as a full genus to include a number of Recent and late Tertiary fusoid shells from the Atlantic coastal states and the Antillean region, which differ from *Fusinus* (*Fusus*) in having the nuclear whorls sculptured with strong axial riblets over their entire surface, whereas in true *Fusinus* the whorls of the protoconch are largely smooth except on the final half turn, which is sculptured with riblets and sometimes spiral threads. *Fusus caloosaensis* Heilprin, a Pliocene species from Florida, Grabau selected as the genotype. Most species of *Heilprinia* are stout, closely coiled, with a relatively short spire and well-rounded, convex whorls. The anterior canal is long, straight or moderately twisted. Axial ribs are present on the earlier whorls, usually fading out on the penultimate and final turns. At maturity the parietal callus generally thickens to form a high, free-edged, laminar blade. Several fossil species and subspecies have been named from the Miocene and Pliocene formations of the Atlantic states, and occur as far north as Maryland and Virginia. *Fusinus barbarensis* (Trask), from the Pliocene of California, was at first considered to be a *Heilprinia* by Grabau, but later transferred to another group named *Barbarofusus* by Grabau and Shimer, 1909.

The shell herein described under the name *Fusinus* (*Heilprinia*) *dowianus,* new species is the second Recent species of the subgenus. It differs strikingly from *Fusinus* (*Heilprinia*) *timessus* (Dall) by its longer, more slender form and higher spire. In these respects, *F. dowianus* is more similar to *F.*

caloosaensis of the Caloosahatchee Pliocene of southern Florida. Five specimens were collected by Mr. Thomas Dow of which three have been examined in the course of this study.

FUSINUS (HEILPRINIA) DOWIANUS, new species Plate 8, figs. 2, 3

The shell is moderately large, fusiform, the spire a little shorter than the length of the aperture and anterior canal. Spire is relatively slender, composed of about twelve whorls including the nucleus. General ground color of the shell is white except for a portion of the spire which has a pink or amber color which is deepest between the ribs and around the suture. The nucleus is that typical of the subgenus and composed of one and a half whorls finely sculptured over the entire surface by strong, axial riblets (about sixteen to the turn); the color of the protoconch is a deep amber brown. The change from the nuclear stage to the nepionic is sharp and abrupt, indicated by the assumption of spiral sculpture. Whorls are well-rounded, their convexity being accentuated by the coarse ribs which persist through over the penultimate whorl, fading out only on the back of the body-whorl in a fully adult specimen. The ribs and their interspaces are crossed by strong, ridge-like spiral threads, rather well spaced, the concave intervals between them marked by still smaller secondary and tertiary spirals, the whole crossed by longitudinals imparting a coarse, cross-etched effect which shows best on the whorls of the spire. The anterior canal is fairly long and slender, about one-third the total length, thick and straight in the upper section, more slender and slightly twisted in the lower, the canal itself narrow and open along its whole length. The aperture is semilunate, the outer lip strongly and deeply lirate within. Inner lip has a callous spread over the parietal wall which in the adult shell becomes free in its lower part to form a high, wide, wing-like blade. Operculum corneous, thick, of the usual *Fusinus* type.

Length 137 mm., aperture and canal 83 mm., greater diameter 39.3 mm.

Of this splendid species, three specimens have been seen. The largest shell selected as the type has a length of 137 mm. and, except for a slightly weathered protoconch, is well-preserved in other respects. *Fusinus timessus,* the only other known Recent

species of *Heilprinia,* is generally a smaller and stouter shell, with a wider, more inflated or rounded body-whorl.

This shell, one of the finest species of the subgenus, is named for Mr. Tom Dow of South Miami, who collected all the known specimens.

Locality: Northwest of Caxones Island, off the northeast coast of Honduras, in 30 fathoms.

A NEW SPECIES OF HUMBOLDTIANA FROM TEXAS

By JUAN JOSÉ PARODIZ

Carnegie Museum

HUMBOLDTIANA EDITHAE, n. sp. Plate 9, 3 left figures

Shell subglobose-depressed, deeply umbilicate but with the perforation narrowed by the expansion of the columellar margin of the peristome; rather thin and translucent. Color white, with only two brown bands almost equal in size (4.5 mm. wide at the ends), on the upper and lower part of the last whorl; the separation between the bands is 8.5 mm. on its wider part near the lip; the lower band is not visible from an apical view; each band ends 2.5 mm. from the peristomatic edge, and are perfectly visible inside the aperture. Suture without colored border. 4 whorls — 150°, very convex; * the first 1½ whorls smooth and the following with minute sculpture of pits and radial wrinkles of growth very irregular; the minute granulation continues over the wrinkles. Large aperture, 74.9% of the height of the shell and very oblique, forming an angle of 32° with the columellar axis.

Type: Carnegie Museum no. 42,895, from Mt. Emory at Chisos Mountains (elevation 7000 feet), on granite outcrop, Big Bend National Park, Brewester County, Texas. Coll. Miss Edith H. Long, 1949.

Measurements (in mm.):

Diameter (major)	38.1
Diameter (minor)	31.5
Height	32.7

* For the number of whorls and measure of the angles, Diver's and other methods have been used, as explained by the author in "Physis," XX, 58: 241, Buenos Aires, 1951.

Aperture (height)	25.5
Aperture (wide)	21.0
Sutural angle *	2°
Spiral angle	125°
Columellar angle	10°
Whorls	4–150°

Humboldtiana edithae is a larger and more depressed form than any other species of the genus known from Texas. *H. cheatumi* Pilsbry, nearest in size, is only 29 mm. high and 33.5 wide, with higher spire and smaller aperture, and the wrinkles of growth stronger.

It differs also from other Texan species by having only two wide brown bands. The only species of *Humboldtiana* occasionally with two bands is *H. fortis* Pilsbry from Nuevo León, Mexico. *H. montezuma* from the same region is a larger, very globose species, without bands, except in the subspecies *inferior* which is three-banded. All these Mexican species are very different from the Texan forms, and especially *H. edithae,* and their localities are 400 miles southeast.

The surface of the new species is of an intermediate type between *H. palmeri* and *H. chisoensis* Pilsbry; from the last form, which inhabits a nearby locality in the Big Bend Nat. Park, it differs by its very large size, larger aperture, more depressed spire, and has not the intermediate peripheral band which makes the suture margined with brown.

It is a pleasure for the author to name this species for Miss Edith H. Long, of Del Rio, Texas, collector of the specimen in 1949.

NOTES ON THE MOLLUSCAN FAUNA OF GALESVILLE, MARYLAND

By J. FRANCES ALLEN

Department of Zoology, University of Maryland

During the past six years, collections of the molluscan fauna have been made at Galesville, Maryland, and observations on the environmental changes and relative differences in the distribution of these forms were recognized.

Galesville, on the western shore, is located on the West River adjacent to Chesapeake Bay. The immediate area under consideration is a part of the shore bordering on Tent House Creek, a short westerly indentation of the West River.

Beginning at the upper extremity of Tent House Creek, the shore line is rather irregular, some of it being flat, some of it sloping gently toward the water, and the other part being a steep bank which is subject to continual wave action. The upper region is densely populated with *Spartina alterniflora,* the cord grass. It is rather marshy and there are several indentations where land drainage flows into the water. Next to this is the sloping beach which extends outward to form a mud flat which is partially exposed at low tide. *S. alterniflora* occurs here only sporadically. The beach is interrupted by a steep bank where there is continual eroding away of the land. Beyond, the bank is again a level area which also supports *Spartina alterniflora. Scirpus americanus,* the three square bullrush, also occurs here. Above the high tide line the marsh willow, *Ioa vitrea,* forms a boundary line, and then *S. patens* extends over the drier part of the area.

The bottom composition of the mud flat consists mainly of a mud-sand mixture, although in some spots it is noticeably more sandy than muddy. According to O'Rourk (1948), the sediment has the following composition: 93% sand, 7% total colloids, 6.3% conventional clay, 0.7% conventional silt, and 6.1% finer clay. There was an unusually large amount of glauconite in the soil. These determinations were made by the Department of Agronomy of the University of Maryland. From personal observations, the area up the shore appeared to be more sandy.

The ribbed mussel, *Volsella demissus* (Dillwyn), during the early period of observations, grew abundantly attached to and around the roots of *S. alterniflora* (Allen, 1952). These forms, in the majority of cases, were located in groups around the *Spartina.* However, their location could be determined by the slit in the mud due to valve action, showing their presence when the animals themselves were embedded too deeply to be seen. This locality has been subject to continuous silting and erosion so that at the present time, the mussel population has almost entirely disappeared. There are very few young mussels; the

majority are large. Measurements show that they range as high as 99 mm. in length with the greatest proportion being between 70 and 80 mm. in length.

Associated with *Spartina alterniflora* is the common periwinkle, *Littorina irrorata* (Say), which is widely distributed along the shores of Chesapeake Bay (Allen, 1952). During the winter, these gastropods burrow in the mud at the roots of the cord grass and remain there until spring. They differ in this habit from the same species on the Eastern Shore, especially along the Little Annemessex River (Allen, 1954) and Pocomoke Sound of Chesapeake Bay. There they remain on the surface or are submerged under six or more inches of water. Large numbers will crawl on *S. alterniflora* which may be a source of food.

Living in association with *Littorina irrorata* is the marsh snail, *Melampus bidentatus lineatus* Say. This species dwells on the shore where it is sometimes flooded at high tide, but it is more abundant slightly farther from the water. Eighteen inch quadrat samples show that *L. irrorata* and *M. b. lineatus* occur in a ratio of 25 to 21.

Associated with *Melampus bidentatus lineatus* and also living at a still greater distance from the water or from the normal high tide line is *Detracia floridana* Shuttleworth of the family Ellobiidae, reported for Chesapeake Bay by Morrison (1950). The hibernating tendency of *M. b. lineatus* to cluster together in winter and find shelter under stalks of cord grass, debris, and boards (Hausman, 1932 and 1948) was observed to occur. But within the *Melampus* groups, *Detracia floridana* was present in abundance. During the collections of November, 1953, *Detracia floridana* outnumbered *M. b. lineatus* approximately three to one. Morrison (1951) has said that under estuarine conditions, the former is universally abundant and that it tolerates salinities somewhat lower than *M. b. lineatus*.

The composition of the bottom sediments has been described. The submerged vegetation here includes: *Zannichellia palustris* (Linn.), the horned pondweed, which is greatest in abundance; *Potomageton bupleuroides* (Fernald) which is second in abundance; and *Ruppia maritima* (Linn.), the least abundant. These plants have been carefully examined and the snail fauna ad-

hering to them has always been poor. A few specimens of small forms, believed to be hydrobiids, were collected and they have been given to Dr. J. P. E. Morrison, United States National Museum, for future identification. Also attached to the submerged vegetation were a few bivalves, *Congeria leucophaeta* Conrad. This latter form was found in considerable numbers attached to submerged concrete blocks around the point, adjacent to the steep bank previously mentioned. Young representatives of *Volsella demissus* were attached with them as well.

Samples from the bottom, some of which were sieved, produced two bivalves, both of which occur abundantly both intertidally and subtidally. *Mya arenaria* (Linn.), the soft clam, lives at a depth of from eight to ten inches. The mortality of the young is apparently great for at times, especially following rough weather, the bottom is virtually covered in some places with small dead *Mya*. Specimens up to 64.5 mm. in length have been dug here.

Macoma balthica (Linn.) is more numerous than *Mya arenaria* and it grows to a size of more than two inches in length. There is a noticeable difference in the coloration of the inside of the valves, some being a definite bright pink, and others being white. Examination of the media from which they were dug showed that the pink ones are confined to areas whose composition is sandy, while the white ones come from those places which are almost exclusively mud. Pratt (1935) says that in muddy bottoms the shells are thick and covered with a dark or rusty colored periostracum, and that in sandy localities, pure white or pinkish or yellowish periostraca and thin shells are characteristic. This implies that the color is on the outside of the valve. Personal observations in this particular locality have determined that the periostracum is rather dark, with an occasional rust color at the ventral edge of the shell. In the case of *Mya arenaria,* the rusty periostracum is quite obvious.

In conclusion, the molluscan fauna of Galesville is represented, from current observations, by six families including seven species. The hydrobiids are excluded. These species include: *Detracia floridana* Shuttleworth and *Melampus bidentatus lineatus* Say of the family Ellobiidae; *Littorina irrorata* (Say) of the Littorinidae; *Volsella demissus* (Dillwyn) of the Mytili-

dae; *Congeria leucophaeta* Conrad of the Dreissenidae; *Macoma balthica* (Linn.) of the Tellinidae; and *Mya arenaria* (Linn.) of the Myacidae.

Literature Cited

Allen, J. Frances. 1952. The morphology of the radula of *Littorina irrorata* (Say). Trans. Amer. Micros. Soc. **71**: 139–145.

——. 1954. Notes on the gastropods collected in the vicinity of Crisfield, Maryland. Naut. **67**: 92–94.

Hausman, Sybil A. 1932. A contribution to the ecology of the salt marsh snail, *Melampus bidentatus* Say. Amer. Nat. **66**: 541–545.

——. 1948. Further studies on the marsh snail (*Melampus bidentatus* or *lineatus*). Amer. Nat. **82**: 137–144.

Morrison, J. P. E. 1950. American Ellobiidae—an annotated list. Amer. Malacological Union Report 1950.

——. 1951. Two new western species of pulmonate molluscs of the genus *Detracia* and two old ones (family Ellobiidae). Jour. Wash. Acad. Sci. 41: 17–20.

O'Rourk, Ann Elizabeth. 1948. A study of the annelid worm population of the inshore region of Chesapeake Bay at Galesville and Solomons. Unpublished M.S. thesis, University of Maryland.

Pratt, H. S. 1935. A manual of the common invertebrate animals. Blakiston. 854 pp.

SHELL BEARING MARINE MOLLUSKS OF CAPE ANN, MASSACHUSETTS

By ARTHUR H. CLARKE, JR.

During the past four years my wife and I have been collecting marine mollusks in the vicinity of Cape Ann. From beach collecting in all seasons and after storms, we have accumulated a fair number of species. Recently additional material obtained from fisherman's nets and from fish stomachs has increased the list considerably and has produced some interesting new records, including at least one new species.

Cape Ann is in Essex County, Massachusetts. It is approximately 35 miles northeast of Boston and fifteen miles south of the New Hampshire state line, and constitutes a prominent fea-

ture of the New England coastline, jutting out into the Atlantic for nearly twenty miles and forming the northern boundary of Massachusetts Bay. The only city on Cape Ann is historic Gloucester, still world famous as a leading fishing port and summer resort.

Most of Cape Ann is actually an island, cut off from the mainland by a narrow salt water passageway, the Annisquam River. The shore line is alternately sandy and rocky. To the north and east, the ocean bottom falls away gradually to 60 fathoms, approximately ten miles from shore, and is intermittently sand, mud and gravel or a mixture of all three.

It is in this general area that so much work has already been done. Mighels, Adams, Gould, Couthouy, Verrill, Morse, Winkley and others have collected extensively in this and nearby regions. The area is a relatively rich one for New England and is still a very fascinating territory to collect.

The most productive locality for beach collecting was found at Wingaersheek Beach, Gloucester, facing northward into Ipswich Bay. It is typically New England in its topography, tremendous boulders and rocky outcrops are scattered in patches between stretches of fine sand. Northeast storms often litter the beach with shells, many of which may be from deep water or are rare species.

Extensive local gill net fishing also provides a good source of material. The fishing is done in nearby waters from 25 to 60 fathoms. The weighted edges of the nets lie on the bottom and mollusks, spider crabs, large sea anemones, and several species of starfish including the nine- to twelve-rayed Solasters and Crossasters are often accidentally drawn up. The most abundant invertebrate is the brachiopod *Terebratulina septentrionalis* Couthouy, found clinging to almost every solid object. Most of these animals are thrown overboard as soon as they come on board the boats, but some always escape and fall out on the pier where the nets are dried. Here they may be easily collected.

Recently we have been searching for shells in the stomachs and intestines of fish caught in these nets. Most of the shells were found in haddock but codfish also yielded many specimens. A large majority of the shells were found in the lower digestive

tracts; less than 10% were actually found in the stomachs. Many small shells which would probably have been overlooked were obtained by straining a water slurry of the intestinal contents through a fine wire mesh, rinsing with water and inspecting the residual material under a low power microscope.

Admittedly some uncertainty exists in regard to the proper locality of shells found in the fish, but W. F. Clapp has suggested, on the basis of convincing evidence, that shells collected in this manner can be regarded as probably from the area in which the fish were caught. (See Nautilus **25**, 104, 1912.)

The following 103 species and 4 subspecies have been collected by my wife, Louise R. Clarke, and me during 1950 to 1953 from Cape Ann and nearby waters. It has been deemed impractical to list all known records from the area. Such a list would be beyond the scope of this paper and belongs in a larger, more comprehensive work. It is believed that the list is nearly complete for this area and presents a fairly accurate picture of relative abundance of species.

The following abbreviations are used:

(G) Generally distributed over the entire coast of Cape Ann.
(GS) Generally distributed after storms.
(WB) Wingaersheek Beach Gloucester.
(WBS) Wingaersheek Beach after storms.
(GN) From gill nets used off Cape Ann, somewhere between 25 and 60 fathoms.
(F25–60) From fish caught off Cape Ann, somewhere between 25–60 fath.
(F28–40) From fish caught off Cape Ann, somewhere between 28–40 fath.
(F52–54) From fish caught off Cape Ann, somewhere between 52–54 fath.

Lepidochiton (*Tonicella*) *marmorea marmorea* Fabricius. (GN) rare.
Solemya (*Petrasma*) *borealis* Totten. (WBS) uncommon.
Nucula proxima proxima Say. (F25–60, F28–40, F52–54) common.
N. tenuis tenuis Montagu. (F25–60, F28–40, F52–54) common.
N. delphinodonta Mighels and Adams. (F28–40) uncommon.
Nuculana tenuisulcata Couthouy. (GN, F25–60) rare.

Yoldia sapotilla Gould. (F25–60, F28–40, F52–54) common.
Y. (*Megayoldia*) *thraciaeformis* Storer. (F25–60, F28–40, F52–54) juveniles common.
Y. (*Yoldiella*) *lucida* Loven. (F25–60, F28–40, F52–54) common.
Pecten (*Chlamys*) *islandicus islandicus* Müller. (GN, F25–60, F28–40, F52–54) common.
P. (*Aequipecten*) *irradians irradians* Lamarck. (WBS) one broken valve, doubtless advectitious.
P. (*Placopecten*) *grandis* Solander. (WBS) rare; (GN, F25–60, F28–40, F52–54) common.
P. (species). (F25–60, F28–40, F52–54) common, tiny dark red specimens.
Anomia aculeata Müller. (GS) common among holdfasts of kelp; (F25–60, F28–40, F52–54) uncommon.
A. simplex d'Orbigny. (GS) uncommon among holdfasts of kelp; (F25–60) uncommon.
Mytilus edulis edulis Linné. (G) abundant.
M. edulis pelucidus Pennant. (G) common, with the preceding.
Modiolus modiolus Linné. (GS) common among holdfasts of kelp; (F25–60) juveniles uncommon.
M. (*Brachidontes*) *demissus plicatulus* Lamarck. (WB) common.
Modiolaria niger Gray. (GN) one specimen.
M. substriata Gray. (GN) uncommon.
Crenella decussata Montagu. (F25–60, F28–40, F52–54) uncommon.
C. glandula Totten. (F25–60, F28–40, F52–54) common.
Periploma (*Cochlodesma*) *leanum* Conrad. (WBS) uncommon.
Thracia conradi Couthouy. (WBS) juveniles uncommon, adults rare and always fragmentary.
T. truncata Mighels and Adams. (WB) one specimen.
Lyonsia hyalina Conrad. (WB) uncommon.
Cuspidaria glacialis Sars. (F25–60) uncommon.
C. obesa Loven. (F28–40, F52–54) uncommon.
Cyprina islandica Linné. (GS, GN) common; (F25–60, F28–40, F52–54) juveniles common.
Astarte castanea picea Gould. (GN) rare.
A. undata Gould. (GN, F25–60, F28–40, F52–54) common.
A. subaequilatera subaequilatera Sowerby. (GN, F25–60, F28–40, F52–54) common.
A. borealis Schumacher. (GN) common.
Venericardia borealis borealis Conrad. (GN, F25–60) common.
V. borealis novangliae Morse. (GN) uncommon.
Thyasira gouldii Philippi. (F52–54) common.
T. plana Verrill and Bush. (F52–54) uncommon.

T. ferruginosa Forbes. (F52–54) one specimen.
Aligena elevata Stimpson. (WBS) abundant 1–13–52. Rare on all other occasions.
Clinocardium ciliatum Fabricius. (GN) rare.
Cerastoderma pinnulatum Conrad. (F25–60, F28–40, F52–54) most abundant mollusk found in fish—purple, brown and yellow specimens common with typical white variety.
Pitar morrhuana Gould. (G) uncommon.
Gemma gemma gemma Totten. (G) common.
Petricola (Petricolaria) pholadiformis pholadiformis Lamarck. (WB) uncommon.
P. (Petricolaria) pholadiformis lata Dall. (WB) rare.
Tellina (Angulus) tenera Say. (G) abundant.
Macoma balthica Linné. (WB) uncommon. Inlets of Annisquam River, abundant.
M. calcarea Gmelin. (GN, F25–60, F28–40) common.
Ensis directus Conrad. (WB) common.
Siliqua costata Say. (WB) common.
Spissula (Hemimactra) solidissima solidissima Dillwyn. (WB) common.
S. (Hemimactra) polynyma Stimpson. (GN) uncommon.
Mulinia lateralis lateralis Say. (WB) rare. Inlets of Annisquam River, uncommon.
Mesodesma arctatum Conrad. Good Harbor Beach, Gloucester, common.
Mya arenaria Linné. (G) common. (F25–60, F28–40) small angular specimens common.
Saxicava arctica Linné. (G) common among holdfasts of kelp; (F25–60) uncommon.
Panomya arctica Lamarck. (GN) common.
Cyrtodaria siliqua Spengler. (WBS) common 11–28–51, rare on all other occasions; (GN) common.
Xylophaga atlanticus Richards. (GN) one specimen.
Teredo navalis Linné. (G) uncommon in floating wood.
Acmaea testudinalis Müller. (G) common.
Lepeta caeca Müller. (GN) one specimen.
Puncturella princeps Mighels and Adams. (F25–60, F28–40, F52–54) common.
Solariella (Machaeroplax) obscura obscura Couthouy. (F28–40) rare.
Margarites helicina Phipps. (WB) on kelp, rare.
M. groenlandica Gmelin. (F25–60, F28–40, F52–54) uncommon.
M. (Pupillaria) cinerea cinerea Couthouy. (F25–60, F28–40, F52–54) uncommon.
Calliostoma occidentalis Mighels and Adams. (F28–40) uncommon.

Calliostoma (species). (GN) one worn specimen, doubtless advectitious.
Epitonium (*Boreoscala*) *greenlandicum* Perry. (GN) rare; (F25–60, F28–40, F52–54) uncommon.
Turbonilla louiseae (New species, description below). (F52–54) one specimen.
Natica (*Tectonatica*) *clausa clausa* Broderip and Sowerby. (F25–60) uncommon.
Polinices (*Euspira*) *heros* Say. (G) common.
P. (*Euspira*) *triseriata* Say. (WB) rare.
P. (*Euspira*) *groenlandica* Möller. (F28–40) rare.
Velutina laevigata Linné. (F25–60, F28–40, F52–54) common.
Crepidula fornicata Linné. (G) uncommon. Long Beach, Gloucester, common.
C. plana Say. (G) uncommon; (GN) inside apertures of dead *Neptunea decemcostata* Say, common.
Alvania carinata Mighels and Adams. (F28–40) one specimen.
Littorina littorea Linné. (G) abundant.
L. obtusata Linné. (G) common on shore rocks.
L. saxatile saxatile Olivi. (G) common on shore rocks.
L. saxatile tenebrosa Montagu. Inlets of Annisquam River, common.
Lacuna vincta vincta Montagu. (G) common.
Trichotropis borealis costellata Couthouy. (F20–60) rare.
Aporrhais occidentalis occidentalis Beck. (WBS) rare; (GN) uncommon.
Thais lapilla lapilla Linné. (G) common.
Nassarius (*Ilyanassa*) *obsoleta* Say. (WB) rare.
N. (*Tritia*) *trivitata* Say. (G) common.
Buccinum undatum undatum Linné. (WBS, GN)common; (F20–60) uncommon.
B. cyaneum cyaneum Bruguière. (GN) one specimen, possibly advectitious.
Neptunea decemcostata Say. (WBS) uncommon; (GN) common.
Colus stimpsoni stimpsoni Mörsch. (WBS) uncommon; (GN) abundant.
C. stimpsoni brevis Verrill. (WBS) common.
C. (*Siphonorbis*) *pygmaeus* Gould. (F20–60, F28–40, F52–54 common.
Lora scalaris scalaris Möller. (F28–40) rare.
L. decussata decussata Couthouy. (GN, F20–60, F28–40, F52–54) common.
Pleurotomella (species). One specimen, possibly undescribed.
Admete couthouyi Say. (F20–60, F28–40, F52–54) uncommon.

Retusa gouldii Couthouy. (F28–40) uncommon.
R. pertenuis Mighels. (F28–40) uncommon.
Diaphana debilis Gould. (F28–40) rare.
Cylichna (*Bullinella*) *alba alba* Brown. (F20–60) rare.
Limacina retroversa retroversa Fleming. (F52–54) rare.
Melampus lineatus Say. Inlets of Annisquam River, abundant.

A few species, generally common on northeast Massachusetts shores, were not found by us on Cape Ann. The most outstanding examples were:

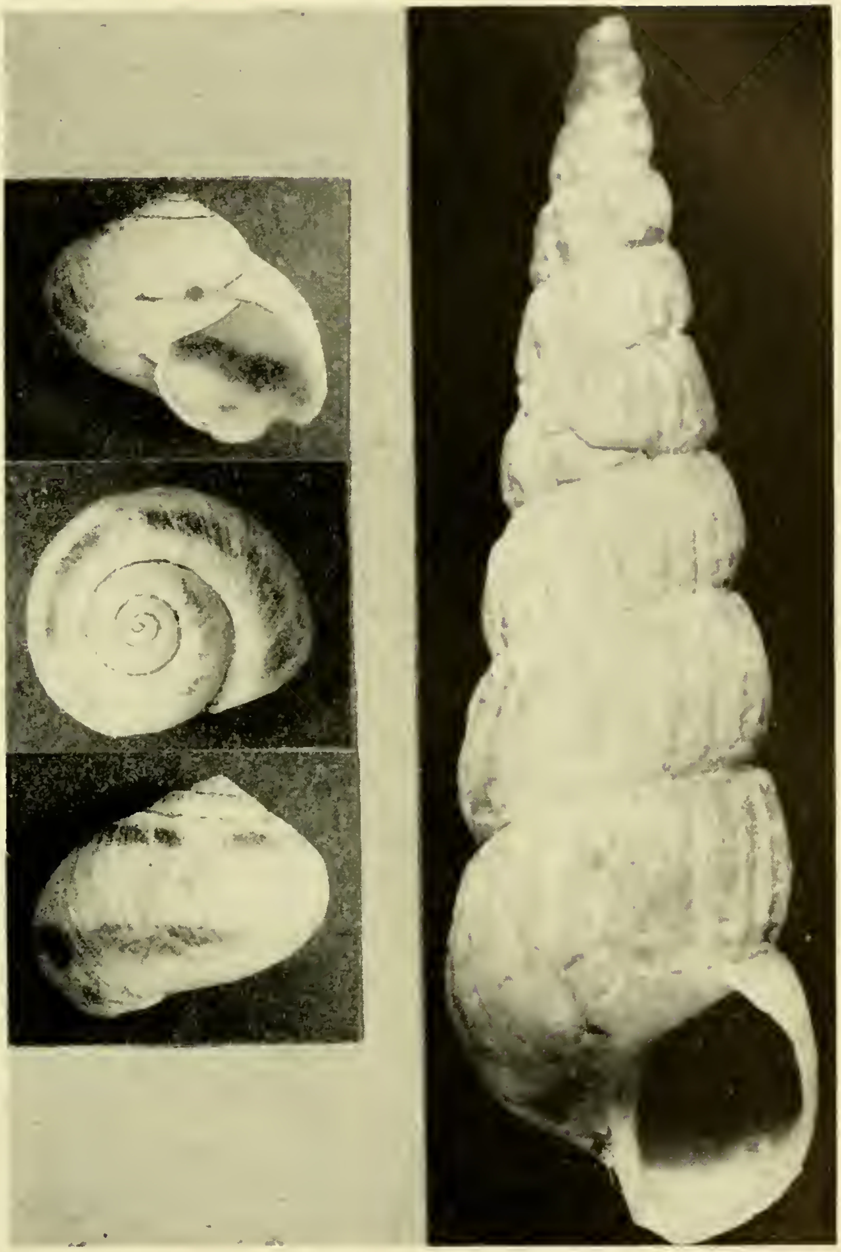
Pandora gouldiana Dall. Common at West Beach, North Beverly, and Marblehead in 1–2 fathoms.
Zirphaea crispata Linné. Common at West Beach, North Beverly, and Salisbury Beach, Salisbury.
Polinices (*Neverita*) *duplicata* Say. Common at Dane Street Beach, Beverly. This locality seems to be the northern limit for this species.

TURBONILLA LOUISEAE, new species Plate 9, right figure

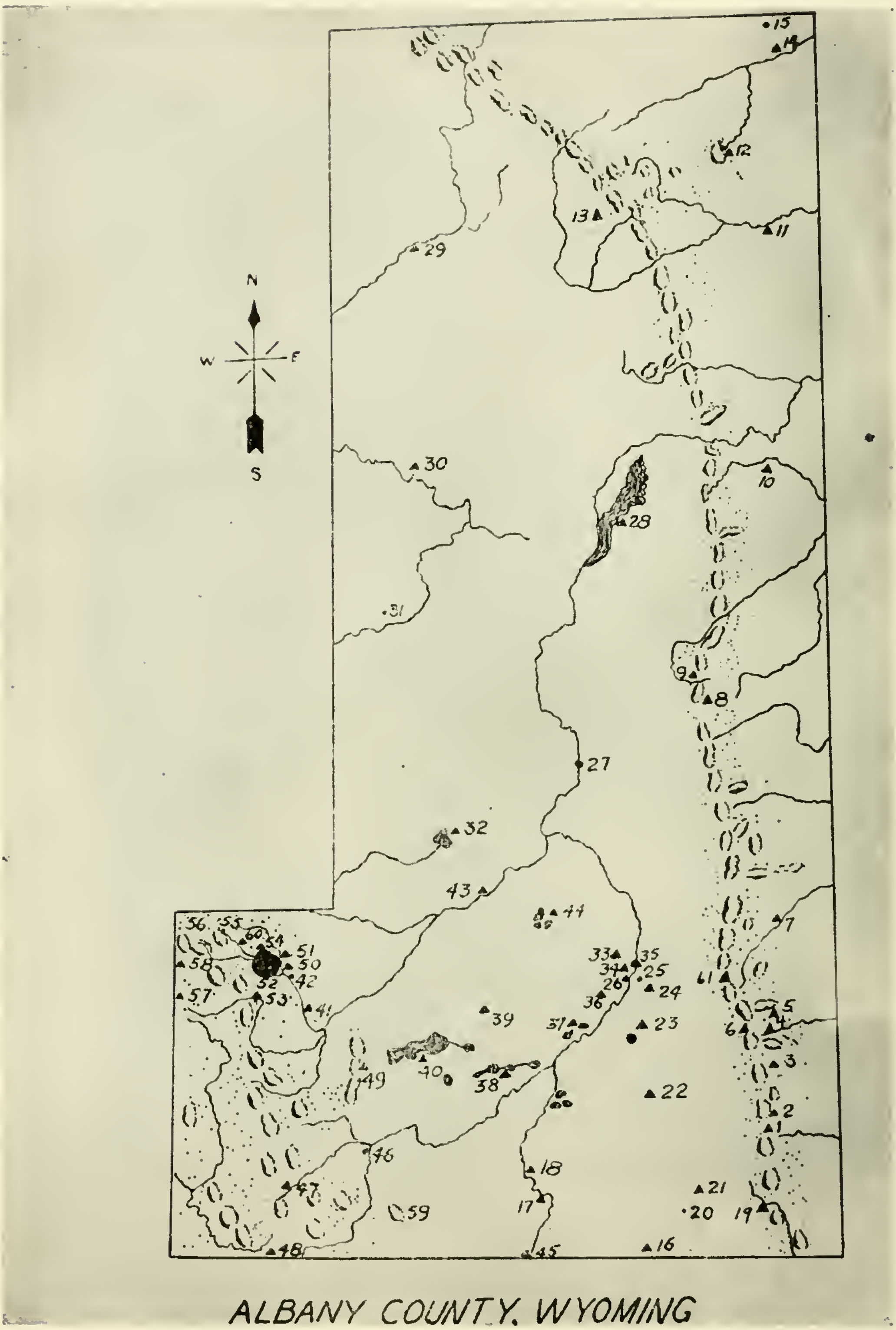
Shell gray, faintly lustrous, elongate and with a regularly tapering, acute spire. Periostracum thin, light brown. Whorls ten, uniformly rounded and impressed at the sutures. First three whorls smooth, fourth whorl crossed by 17 broad, rounded, straight light brown, prominent ribs separated by grooves. Ribs increasing in number and angularity on successive whorls to 28 on the body whorl where each rib has assumed a flattened sigmoid curve. Grooves equal to ribs in width but lighter in color. Ribs and grooves crossed by numerous fine, spiral lines, more distinct on the body whorl, but apparent on all ribbed whorls, especially in the grooves between the ribs. Aperture sub-ovate, lip thin, somewhat thickened at columella. Length 9 mm., width 2½ mm. (F52–54) One specimen.

From shell characters alone, *T. louiseae* is apparently more closely related to *T.* (*Strioturbonilla*) *formosa* Verrill and Smith 1880 (= *T. bushiana* Verrill 1882) than to any other North Atlantic species. *T. formosa* has been recorded from off Georges Bank, Mass. and Long Island, N. Y. in 365 to 1525 fathoms. Several significant differences between the two species have been observed, however.

T. formosa is white, lustrous and iridescent while *T. louiseae* is gray, only faintly lustrous and not iridescent. No periostracum was seen on living specimens of *T. formosa* by Verrill;



Left 3 figs. *Humboldtiana edithae* Parodiz.
Right fig. *Turbonilla louiseae* Clarke.



For key to numbers, see pages 128–129.

a light brown periostracum is present on *T. louiseae.* Spiral lines are absent in *T. formosa* but are obvious on all but the nuclear whorls of *T. louiseae.* Finally, the whorls are more flattened and the ribs are less distinct in *T. formosa* than in *T. louiseae.*

Only one specimen has been found, and that was taken in April 1953 from the stomach of a haddock caught off Cape Ann in 52 to 54 fathoms. The holotype is now number 189662 in the collection at the Museum of Comparative Zoology. By a coincidence, it was the first shell found by the author in fish taken from Cape Ann waters.

Through a regrettable error during the cleaning process, the specimen was allowed to soak in a strong soap solution for an excessive length of time and the thin periostracum was dissolved by the alkaline component of the soap. The figure, therefore, does not show the periostracum.

This species is named in honor of my wife, Louise R. Clarke, who cheerfully accompanied me on all of our collecting trips, many of which were made in zero winter weather, and who personally found a great many of the rarer species. Without her help in collecting specimens and in typing the manuscript, this paper could not have been written.

I wish to thank Dr. William J. Clench and Dr. Ruth D. Turner for their generous cooperation and help in the identification of some of the species, for their valuable suggestions in connection with this paper, and for permitting the writer to have access to the large and excellent collection at the Museum of Comparative Zoology.

References

Blaney, D. W. 1906. List of the Shell Bearing Mollusca of Frenchman's Bay, Maine. Proc. Boston Soc. Nat. Hist. **32**, 23–41.

Clench, W. J. 1941–1951. Johnsonia, Vols. I–II.

Gould, A. A. Ed. by W. G. Binney. 1870. Report on the Invertebrata of Massachusetts. Boston. Wright and Potter, State Printers.

Johnson, C. W. 1915. Fauna of New England. List of the Mollusca. Occas. Papers Boston Soc. Nat. Hist. **7**, No. 13, 1–231.

——. 1934. List of the Marine Mollusca of the Atlantic Coast from Labrador to Texas. Proc. Boston Soc. Nat. Hist. **40**, 1–204.

Sars, G. O. 1878. Mollusca Regionis Arcticae Norvegiae. xvi + 466 p. Christiana, (Norway).

Verrill, E. A. 1882. Catalog of Marine Mollusca Added to the Fauna of the New England Region, During the Past Ten Years. Trans. Conn. Acad. **5**: 447–587.

PLEISTOCENE MOLLUSKS FROM ANDROS ISLAND, BAHAMAS

By HORACE G. RICHARDS

Academy of Natural Sciences, Philadelphia, Pa.[1]

Through the kindness of Dr. Norman Newell of the American Museum of Natural History in New York, a collection of Pleistocene mollusks from Andros Island was submitted to the writer for study. The material came from a fossil reef at Fresh Creek Village from elevations between 2 and 11 feet above high water mark. The radio-carbon tests give a figure of more than 30,000 years. Therefore it seems probable that these shells date from a pre-Wisconsin (or possibly inter-Wisconsin) high stand of the sea. The shells all indicate warm water similar to that in the region today. All the species are common in Bahama waters today except *Cantharus auritula* (Link) which is somewhat rare.

The main collection is at the American Museum of Natural History with some duplicates at the Academy of Natural Sciences.

Pelecypoda

Arca occidentalis Philippi
Echinochama arcinella (Linné)
Lucina pennsylvanica (Linné)
Codakia orbicularis (Linné)
Chione pubera (Valenciennes)
Tellina fausta Donovan

[1] Also University of Pennsylvania.

GASTROPODA

Diadora listeri (d'Orbigny)
Livonia pica (Linné)
Tegula scalare (Anton)
Calliostoma jujubinum perspectivum Philippi
Astraea celata (Gmelin)
Astraea longispina (Lamarck)
Vermicularia spirata (Philippi)
Conus sp.
Cerithium floridanum Mörch
Cyphoma gibbosum (Linné)
Trivia pediculus (Linné)
Thais deltoidea (Lamarck)
Cymatium chlorostoma (Lamarck)
Columbella mercatoria (Linné)
Cantharus auritula (Link)
Fasciolaria distans Lamarck

For further data on the Pleistocene fossils, see Dall.[2]

TERRESTRIAL AND AQUATIC MOLLUSKS OF ALBANY COUNTY, WYOMING

BY DOROTHY BEETLE

Albany County lies in southeastern Wyoming, adjoining Colorado. The county has an area of 4,339 square miles, 800 square miles more than the area of Delaware and Rhode Island combined. New Jersey is not quite twice the size of Albany County. Most of the land is utilized as ranches. There is some Taylor Grazing Land, the rest being in National Forest. The population of the county is slightly over 20,000.

The main geographical features of Albany County are those of a high mountain plateau or basin rimmed on its eastern and western edges by mountain ranges. The Laramie Mountains border the county on the east, rising just south of the Wyoming-Colorado border. Near the northern county line, the mountain chain alters direction, so that the mountains curve to the north-

[2] Dall, William H. Fossils of the Bahama Islands, with a List of the Non-marine Mollusks. *In* "The Bahama Islands," Geographical Spc. of Baltimore, Johns Hopkins Press, 1905, pp. 23–47.

western corner and terminate in Natrona County. The crest of the Laramie Mountains is rather uniform in height at approximately 8,000 feet. Laramie Peak, set somewhat apart from the main mountain chain, has an elevation of 10,274 feet.

The Laramie Basin lies between 7,100 and 7,500 feet. The Basin is drained by the Big and Little Laramie Rivers. They join to form the Laramie River proper which has cut a channel midway through the Laramie Mountains to flow into the North Platte River. All waters in the county eventually flow into the North Platte. East of the Laramie Mountains the elevation drops to 6,500 feet.

The Medicine Bow Mountains occupy the southwestern section of the county and extend into Carbon County. These beautiful mountains average about 1,000 feet higher than the Laramies. Near their center is a group of glaciated peaks known as the Snowy Range. Medicine Bow is the highest peak with an elevation of 12,005 feet.

Localities

I. Laramie Mountains. The Laramie Mountains are a peneplain that has been eroded to Pre-Cambrian granites. The granites outcrop along the crest of the mountains and in the vicinity of Vedauwoo appear as monuments. The soil is shallow and neutral to slightly acid, ranging to a pH of 6.5. The creeks are tiny and run over granite gravel bottoms. Where they have been dammed by beaver, *Pisidium, Physa* and *Lymnaea* may be found in the black mud bottoms. The average annual rainfall is between 12 to 18 inches. The mean summer temperature near the summit is 52 to 55° F.

The Laramie Mountains are unique in lacking a true plant climax. Here occurs the transition from a plains to a mountain flora. All of the trees native to Wyoming may be found in scattered stands here in locally favored situations.

In aspen groves, particularly those along the creeks and about the beaver dams, the greatest variety and quantity of mollusks have been found (26 species). The Douglas fir (*Pseudotsuga taxifolia*)–blue spruce (*Picea pungens*) communities rank second in number of species (10) found. Mature ponderosa pine (*Pinus ponderosa*) stands yield fewer snails (6) species.

On the western flanks of the Laramie Mountains, limestone, sandstone, and shales outcrop. The land is steep and dry with only intermittent flowing creeks. The soil is generally alkaline or saline. Grasses and woody shrubs such as mountain mahogany (*Cercocarpus montanus*) are the dominant vegetation. In crevices in the rocks and under slopes with a northern or eastern exposure, a limited snail population can be found. *Vallonia, Pupilla* and *Oreohelix* species apparently alone occupy the range. Moisture appears to be the limiting factor.

II. The Laramie Basin. The Laramie Basin is a grass-covered plateau largely underlain by sedimentary rocks. In comparatively recent geological time, it has been dug out by wind and water. The Big Hollow, a wind eroded depression nine by three miles in dimension, is a conspicuous example of wind action which still continues all over the basin. The soils are alkaline or saline and support a shortgrass and mixed grass association. A few trees grow along the waterways, primarily narrow-leafed cottonwood (*Populus angustifolia*) and willows (*Salix* sp.). Many streams are intermittent; lakes and ponds are strongly alkaline.

The growing season in the basin lasts about 90 days as contrasted to about 70 days in the mountains. Not much activity among the snails has been noted outside these limits. Minimum winter temperatures drop to − 40° F. Summer maximums range above 80° F. The average yearly rainfall is 11.35 inches, received mainly between April and August. The average relative humidity is 65 percent. The winds are steady and moderate, their direction being influenced considerably by the local topography. Low precipitation, low temperatures and low relative humidity combined with a high rate of evaporation, limit the mollusk population.

Various small creeks and the Laramie River have yielded species of *Physa, Lymnaea, Sphaerium, Ferrissia, Aplexa,* and *Gyraulus.* Some ponds have become so salty that they contain no mollusks at all. I have dug below the salt crust of some dried-up ponds, but have found no remains of snails. Along the banks of Spring Creek a species of *Helisoma* was found weathering out of the topsoil. A sagebrush community borders the Basin and *Oreohelix subrudis* often occurs in considerable

numbers in the open about the base of the shrubs. Other than these, no specimens have been found in the Basin.

III. Medicine Bow Mountains. The Medicine Bow Mountains are composed largely of igneous and metamorphic rocks. About 8,500 feet the region has been subjected to two cycles of glaciation. Permanent snowbanks may be found above 10,000 feet. The soil is deeper than that on the Laramie Mountains, and is neutral to slightly acid. The average yearly rainfall is 20 inches, distributed rather evenly over the year. The mean summer temperature on the mountain heights is 47° F. Winter minimums probably drop below − 60° F.

There are numerous small seepage lakes, moraine ponds and beaver ponds. Some lakes are fed by melting snow on their banks even in July and August. The water in lakes near the summit is so nearly neutral that it can be used as distilled water.

The Transition Zone, as defined by Merriam, occupies the foothills up to about 8,000 feet. Sedimentary rocks eroded into hogbacks usually underlie the area in this county. Mountain mahogany (*Cercocarpus montanus*) and ponderosa pine (*Pinus ponderosa*) are the dominant vegetation. Douglas fir and blue spruce are to be found in the moist valleys. Narrow-leafed cottonwood, black birch (*Betula fontinalis*), willows and shrubs grow along the streams.

The Canadian Zone has its upper limits at 9,500 to 10,000 feet. The dominant tree is the lodgepole pine (*Pinus contorta*). Bearberry, juniper and various herbs make up the ground cover. Along the streams mountain alder (*Alnus tenuifolia*) is common.

The Hudsonian Zone has its upper limit at timberline between 11,000 and 11,500 feet. The dominant trees are alpine fir (*Abies lasiocarpa*), white barked pine (*Pinus albicaulis*), and Englemann spruce (*Picea engelmanii*), characteristically stunted and wind shaped. Willows grow along the creeks.

The Arctic-alpine Zone extends to the tops of the mountains, but the highest peaks have only barren boulder fields at their summits. Alpine grasses, sedges and flowers as well as thickets of willows grow in this zone, forming a dense carpet where the soil is good. Freezing temperatures may be recorded every month of the year.

Most land shells are found in the Transition and Canadian Zones. Aspen groves have the most populous molluscan com-

munities. In the Douglas fir–blue spruce climax, *Vitrina, Vertigo, Columella, Euconulus, Zonitiodes,* and *Oreohelix* are common. Pure dense stands of young lodgepole pine have yielded no snails at all. Mature lodgepole forest has a somewhat more moist floor. Here *Oreohelix* and *Zonitiodes* appear.

The only place where shells were found in great numbers in the county was at Chimney Rock on Sand Creek. Here a small creek runs through the dry wind-sculptured sandstone beds. It is bordered by a thicket of willow scrub, possibly five feet wide on either side, and the leaf litter teams with *Oreohelix subrudis.*

Species found in Albany County.

Terrestrial Mollusks

Oreohelix strigosa cooperi
Oreohelix subrudis
Euconulus fulvus
Euconulus fulvus alaskensis
Retinella binneyana occidentalis
Hawaiia minuscula
Zonitoides arboreus
Vitrina alaskana
Deroceras laeve
Discus cronkhitei
Succinea stretchiana
Pupilla blandi
Pupilla hebes
Pupilla muscorum
Vertigo concinnula
Vertigo gouldi coloradensis
Vertigo modesta
Vertigo modesta var. *parietalis*
Columella alticola
Columella edentula
Vallonia albula
Vallonia cyclophorella
Vallonia gracilicosta
Vallonia pulchella
Zoogenetes harpa
Cionella lubrica

Aquatic Mollusks

Lymnaea stagnalis appressa
Galba bulimoides cockerelli
Galba palustris
Helisoma trivolvis
Gyraulus vermicularis
Physa ampullacea
Physa forsheyi
Physa gyrina
Physa nuttalli
Physa triticea
Aplexa hypnorum
Ferrissia rivularis
Valvata lewisi helicoidea
Sphaerium striatinum
Pisidium contortum

Species Localities of Laramie Mountains

Middle Fork of Crow Creek: *Physa triticea, Pisidium* sp.
Blair Picnic Ground: *Vallonia cyclophorella, Pisidium* sp.

Wallis Picnic Ground: *Physa triticea*. Pole Mountain, South Fork of Pole (Lodgepole) Creek: *Oreohelix subrudis, Euconulus fulvus, E. fulvus alaskensis, Retinella binneyana occidentalis, Hawaiia minuscula, Zonitoides arboreus, Vitrina alaskana, Deroceras laeve, Discus cronkhitei, Succinea stretchiana, Pupilla blandi, P. hebes, P. muscorum, Vertigo concinnula, V. gouldi coloradensis, Columella alticola, C. edentula, Vallonia albula, V. cyclophorella, V. gracilicosta, Zoogenetes harpa, Cionella lubrica, Galba palustris, Physa nuttallii, Pisidium* sp.

"A Report on the Land Snails of the Jackson Hole Region, Wyoming" (Levi, 1951) notes that earlier workers had considered *Zoogenetes harpa* rare or possibly introduced. In the southern Laramie Mountains I have found *Zoogenetes harpa* three times, two of the localities being in Laramie County. Under one decaying log, 14 mature individuals were clustered. As the three localities are well removed from human habitation, most likely *Zoogenetes* occurs naturally in the area.

Yellow Pine Camp Ground: *Oreohelix subrudis, Euconulus fulvus, Zonitoides arboreus, Vitrina alaskana, Discus cronkhitei, Pupilla muscorum*. Telephone Canyon: *Oreohelix subrudis, Pupilla blandi, Columella edentula, Vallonia cyclophorella*. Horse Creek: *Zonitoides arboreus, Physa ampullacea, Lymnaea* sp., *Pisidium* sp. Roger's Canyon: *Oreohelix subrudis, Columella edentula, Vallonia albula*. Wheatland Cutoff, adjacent hills: *Pupilla muscorum, Vallonia gracilicosta*. North Sibille Creek: *Discus cronkhitei, Pupilla blandi, P. hebes, Vallonia cyclophorella, Lymnaea, Physa ampullacea, Pisidium* sp. Laramie Peak, road along west slope: *Oreohelix subrudis, Euconulus fulvus, Zonitoides arboreus, Discus cronkhitei, Vallonia cyclophorella*. Horseshoe Creek near Esterbrook: *Euconulus fulvus, Zonitoides arboreus, Discus cronkhitei, Vallonia albula*.

Laramie Basin

Fish Creek, Two Bar Seven Ranch: *Succinea stretchiana*. Sand Creek at Wooden Shoe Ranch: *Galba palustris, Physa gyrina*. Pool along road to Wodden Shoe Ranch: *Galba palustris*. Dale Creek: *Physa triticea*. Harney Creek at Hermosa:

Galba palustris. Red Buttes: *Vallonia cyclophorella, Physa ampullacea.* Soldier Creek: *Galba palustris.* Spring Creek: *Vallonia cyclophorella, Galba palustris, Helisoma trivolvis, Gyraulus vermicularis, Physa ampullacea, Valvata lewisi helicoidea, Pisidium* sp. Laramie River at Laramie: *Galba palustris, Physa ampullacea, Aplexa hypnorum, Ferrissia rivularis, Sphaerium striatinum.* Laramie River two miles south of Bosler: *Aplexa hypnorum.* Pioneer Ditch: *Galba palustris, Gyraulus vermicularis, Physa ampullacea, Physa gyrina.* Pool at University of Wyoming Agronomy Farm: *Galba palustris, Gyraulus vermicularis.* Pond on University of Wyoming Livestock Farm: *Lymnaea stagnalis appresa.* Roadside pool on Rt. 230: *Galba palustris.* Seven Mile Lake: *Galba palustris.* Porter Lake, Rt. 130: *Gyraulus vermicularis, Physa ampullacea.* Little Laramie River near Centennial: *Physa ampullacea, Pisidium* sp. Little Laramie River near Quaely: *Lymnaea* sp., *Physa ampullacea, Pisidium* sp., *Valvata lewisi helicoidea.* Lake Hattie Reservoir: *Gyraulus vermicularis.* Bamforth Lakes: *Galba bulimoides cockerelli.*

Medicine Bow Mountains

Chimney Rock: *Oreohelix subrudis, Pupilla blandi, Vallonia cyclophorella.* Woods Landing: *Physa ampullacea.* Camp Roosevelt on Pelton Creek: *Gyraulus vermicularis, Physa* sp., *Pisidium* sp. Sheep Mountain, west side: *Oreohelix subrudis.* University of Wyoming Recreation Camp: *Oreohelix subrudis, Euconulus fulvus, Zonitoides arboreus, Vitrina alaskana, Discus cronkhitei, Pupilla muscorum.* Libby Creek Camp Grounds: *Oreohelix strigosa cooperi, Zonitoides arboreus.* Barber Lake: *Zonitoides arboreus, Vitrina alaskana, Pupilla blandi, Gyraulus vermicularis, Physa ampullacea.* Middle Fork of the Little Laramie River: *Euconulus fulvus, Vitrina alaskana, Deroceras laeve, Vertigo modesta, V. modesta* var *parietalis, Columella edentula, Pisidium contortum.* Nash Creek at Picnic Grounds: *Galba palustris.* Brooklyn Lake: *Galba palustris, Gyraulus vermicularis, Physa* sp., *Pisidium* sp. Telephone Lakes: *Pisidium contortum.*

No collections were made at Lake Marie at 10,000 feet in the

Medicine Bow Mountains. Nothing was found in Rock Creek, Antelope Creek near Garrett, nor Bluegrass Creek.

The foregoing species have been collected by the author during the summers of 1950–1953. Duplicate specimens have been deposited in the University of Colorado Museum, American Museum of Natural History, Academy of Natural Sciences, Philadelphia, and the Chicago Museum. Acknowledgment is made of the aid received from Dr. William Rodeck who permitted the author to examine the collections of the University of Colorado Museum. Thanks are due to Dr. Henry A. Pilsbry and Dr. Fritz Haas who have identified some specimens, and to Dr. George T. Baxter and Dr. Alan A. Beetle who have criticized this manuscript.

Other reports of mollusks from Albany County are as follows:

Baxter, G. T. Fox Creek near Fox Park: *Physa forsheyi, Pisidium* sp. Lake Irene: *Galba palustris.* Porter Lake: *Galba palustris, Physa ampullacea.*

Henderson, J. Chimney Rock: *Pupilla hebes.* Southeast of Jelm: *Euconulus fulvus alaskensis, Zonitoides arboreus.* Seven miles south of Laramie: *Zonitoides minuscula.* Albany County: *Vallonia cyclophorella.*

Pilsbry, H. A. Southeast of Jelm: *Discus cronkhitei.* Near Laramie: *Hawaiia minuscula.*

Baker did not give the exact localities for species of *Lymnaea* and *Galba,* but the ranges of seven species might bring them into the county.

Key to Localities of Map

1, Middle Fork of Crow Creek. 2, Blair Picnic Ground. 3, Wallis Picnic Ground. 4, Pole Mountain, South Fork of Pole (Lodgepole) Creek. 5, Yellow Pine Camp Ground. 6, Telephone Canyon. 7, Horse Creek. 8, Wheatland Cutoff. 9, North Sibille Creek.

10, Bluegrass Creek. 11, North Laramie River. 12, Laramie Peak. 13, Antelope Creek near Garrett. 14, Horseshoe Creek near Esterbrook. 15, Esterbrook. 16, Fish Creek, Two Bar Seven Ranch. 17, Sand Creek at Wooden Shoe Ranch. 18, Pool along road to Wooden Shoe Ranch. 19, Dale Creek.

20, Tie Siding. 21, Harney Creek at Hermosa. 22, Red Buttes. 23, Soldier Creek. 24, Spring Creek. 25, Laramie.

26, Laramie River at Laramie. 27, Laramie River two miles south of Bosler. 28, Wheatland Reservoir. 29, Sheep Creek.

30, Rock Creek. 31, Rock River. 32, James Lake. 33, Pioneer Ditch. 34, Pool at University of Wyoming Agronomy Farm. 35, Pool at University of Wyoming Livestock Farm. 36, Roadside Pool on Rt. 230, four miles west of junction with Rt. 130. 37, Seven Mile Lakes. 38, Soda Lakes. 39, Porter Lake, Rt. 130.

40, Lake Hattie Reservoir. 41, Little Laramie River near Centennial. 42, Centennial. 43, Little Laramie River near Quaely. 44, Bamforth Lakes. 45, Chimney Rock. 46, Woods Landing. 47, Fox Creek at Fox Park. 48, Camp Roosevelt on Pelton Creek. 49, Sheep Mountain.

50, University of Wyoming Recreation Camp. 51, Barber Lake. 52, Libby Creek Camp Grounds. 53, Middle Fork of the Little Laramie River. 54, Nash Fork at Picnic Grounds. 55, Brooklyn Lake. 56, Telephone Lakes. 57, Lake Marie. 58, Medicine Bow Peak. 59, Jelm Mountain.

60, Lake Irene. 61, Rogers Canyon.

References

Baker, F. C. 1911. The Lymnaeidae of North and Middle America. Recent and Fossil. Chicago Acad. Sci. Spec. Publ. 3.

Baxter, G. T. 1952. The Relation of Temperature to the Altitudinal Distribution of Frogs and Toads in Southeastern Wyoming. Ph.D. Thesis Univ. Mich.

Henderson, J. 1924. Mollusca of Colorado, Utah, Montana, Idaho and Wyoming. Univ. Colo. Studies **13** (2).

———. 1936. Mollusca of Colorado, Utah, Montana, Idaho and Wyoming. Supplement Univ. Colo. Studies **23** (2).

Levi, L. R., and Levi, H. W. 1951. A Report on Land Snails of the Jackson Hole Region, Wyoming. Nautilus **65** (2): 60–65.

Merriam, C. H. 1898. Life Zones and Crop Zones of the United States. Bull. 10, Biol. Survey U.S.D.A.

A TECHNIQUE FOR SLUG CULTURE

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Slugs are common pests in greenhouses as well as in gardens. They are economically important, more so in the greenhouse than

out in the field, because of the generally higher value of greenhouse plants. The writer worked on the biology and control problem of the gray garden slug, *Deroceras reticulatum* (Müller), and the following technique for the rearing of slugs was noted to be satisfactory.

A stock culture was kept in a wooden box 20¼″ long, 9¼″ wide and 6″ high with an open top covered by gauze held down by surgical tape. This covering prevented the escape of the slugs and permitted air to circulate in the box. Old boards were put on top of the soil to serve as hiding places for the slugs during the day. The soil was kept damp at all times and the quarters were cleaned twice a month to prevent the growth of molds and fungi. It was checked about every three days for the presence of eggs. Lettuce was used for food and this was supplied when necessary.

Any eggs present were removed and placed in petri dishes lined with filter paper. Drops of water were added to the filter paper, when necessary, to maintain a constant moist condition. Various other containers were used experimentally but the above was found to be the most satisfactory. The eggs collected were carefully handled and observed each day for embryonic development. The relative humidity was considered to be approximately 100 per cent as the dishes were covered and the filter paper kept moist. The writer observed that once embryonic development started in an egg, it took from 17 to 23 days to hatch.

The newly hatched slugs were placed singly in petri dishes lined with moist filter paper. Lettuce was used for food and this was replaced when consumed by the slug. Every four days the slugs were measured. The length and width measurements, in centimeters, were taken when the slug was extended. The width was taken at the widest part of the mantle—dorsal aspect. The petri dishes were examined daily and water was added to keep the filter paper moist. Care should be exercised in temperature regulation. High temperature dried the filter paper and the slugs died. A desirable temperature range would be 65° F to 75° F.

PISIDIUM SPECIES AND SYNONYMS, NORTH AMERICA, NORTH OF MEXICO

(Continued from January number)

By H. B. HERRINGTON

The *Pisidium* species as I understand them, are as follows.

Pisidium casertanum (Poli)

1791. *Cardium casertanum* Poli. Test. utr. Siciliae, Vol. 1, p. 65.
1838. *Pisidium cinereum* Alder. Trans. Nat. Hist. Soc. Northumb. Durh. 2: 341.
1841. *Pisidium abditum* Haldeman. Proc. Acad. Nat. Sci. Phila. 1: 53.
1841. *Cyclas minor* [*minus*] C. B. Adams. Boston Proc. 1: 48.
1842. *Cyclas steenbuchi* Möller. Index. Moll. Groenlandiae, p. 20.
1843. *Pisidium roseum* Scholtz. Schlesien's Moll., p. 140.
1852. *Pisidium regulare* Prime. Boston Jour. 6: 363.
1853. *Pisidium noveboracense* Prime. Ann. N. Y. Lyc. 6: 66.
1863. *Pisidium occidentale* Newcomb. Proc. Acad. Nat. Sci. Calif. 2: 94.
1895. *Pisidium politum* Sterki. Nautilus 9: 75.
1896. *Pisidium randolphi* Roper. ibid. 9: 99.
1896. *Pisidium trapezoideum* Sterki. ibid. 9: 124.
1898. *Pisidium roperi* Sterki. ibid. 12: 77.
1901. *Pisidium streatori* Sterki. ibid. 14: 100.
1902. *Pisidium strengi* Sterki. ibid. 15: 126.
1903. *Pisidium ashmuni* Sterki. ibid. 17: 42.
1903. *Pisidium complanatum* Sterki. ibid. 17: 79.
1903. *Pisidium rowelli* Sterki. ibid. 17: 80.
1903. *Pisidium cuneiforme* Sterki. ibid. 17: 81.
1905. *Pisidium atlanticum* Sterki. ibid. 18: 128.
1906. *Pisidium proximum* Sterki. ibid. 20: 5.
1906. *Pisidium subrotundum* Sterki. ibid. 20: 19.
1906. *Pisidium friersoni* Sterki. ibid. 20: 20.
1906. *Pisidium neglectum* Sterki. ibid. 20: 87.
1907. *Pisidium superius* Sterki. ibid. 20: 98.
1907. *Pisidium succineum* Sterki. ibid. 20: 99.
1911. *Pisidium albidum* Sterki. ibid. 25: 2.

1911. *Pisidium dispar* Sterki. ibid. 25: 2.
1911. *Pisidium inornatum* Sterki. ibid. 25: 3.
1912. *Pisidium alleni* Sterki. ibid. 26: 9.
1913. *Pisidium columbianum* Sterki. ibid. 26: 117.
1913. *Pisidium nevadense* Sterki. ibid. 26: 137.
1916. *Pisidium elevatum* Sterki. Prelim. Cat. N. A. Sphaeriidae, Ann. Carnegie Mus., 10. 3–4. p. 455.
1916. *Pisidium ovum* Sterki. ibid. p. 464.
1916. *Pisidium huachucanum* Pilsbry & Ferriss. ibid. p. 467. Pilsbry & Ferriss (Proc. Acad. Nat. Sci., 1, 173) had named this *P. abditum huachucanum,* but Sterki raised it to the status of a species.
1916. *Pisidium fabale* Sterki. ibid. p. 468.
1916. *Pisidium hannai* Sterki. Proc. U. S. Nat. Mus. 51: 475–477.
1922. *Pisidium griseolum* Sterki. Some Notes on Sphaeriidae with desc. of New Species. Ann. Carnegie Mus., 13. 3–4. p. 432.
1922. *Pisidium orcasenese* Sterki. ibid. pp. 425–439.
1923. *Pisidium lucidum* Sterki. Nautilus, 37: 19.
1923. *Pisidium mirum* Sterki. ibid. 37: 20.

The following, to the best of my knowledge, were never described. They are MS. or label names, but I list them in case they may be in circulation. They are all *P. casertanum* (Poli).

Pisidium anceps Sterki. *Pisidium berryi* Sterki. *Pisidium canadense* Sterki. *Pisidium capax* Sterki. *Pisidium cinetum* Sterki. *Pisidium concinnulum* Sterki. *Pisidium corpulentum* Sterki. *Pisidium devium* Sterki. *Pisidium egregium* Sterki. *Pisidium eyerdami* Sterki. *Pisidium fidalgoense* Sterki. *Pisidium isabellaneum* Sterki. *Pisidium levissimum* Sterki. *Pisidium mamillanum* Sterki. *Pisidium pumilum* Sterki. *Pisidium rugosulum* Sterki. *Pisidium striggill'm* Sterki.

Pisidium nitidum Jenyns

1832. *Pisidium nitidum* nobis: Jenyns. Trans. Camb. Phil. Soc. 4: 304.
1865. *Pisidium contortum* Prime. Mon. Amer. Corb., Smith. Misc. Coll. 145: 73.

1896. *Pisidium pauperculum* Sterki. Nautilus 10: 64–66.
1898. *Pisidium splendidulum* Sterki. ibid. 11: 112–114.
1899. *Pisidium handwerki* Sterki. ibid. 13: 90.
1901. *Pisidium tenuissimum* Sterki. ibid. 14: 99–100.
1906. *Pisidium minusculum* Sterki. ibid. 20: 17.
1913. *Pisidium glabellum* Sterki. ibid. 26: 137.
1913. *Pisidium lermondi* Sterki. ibid. 26: 138.
1916. *Pisidium latchfordi* Sterki. Prelim. Cat. N. A. Sphaeriidae. Ann. Carnegie Mus. 10, 3–4. 16: 452.
1922. *Pisidium prognathum* Sterki. Some Notes on Sphaeriidae with descr. of New Species. Ann. Carnegie Mus. 13. 3–4. pp. 436–437.

I do not think the following were described, but the names are found in MSS. or on labels. *Pisidium flexum* Sterki. *Pisidium overiapicula* Sterki. *Pisidium luteolum* Sterki. *Pisidium amoenum* Sterki.

Form *contortum* Prime. Form *pauperculum* Sterki.

The forms *glabellum* and *latchfordi* are only variations of *pauperculum* and need be given no recognition. The *contortum* are rare, but *pauperculum* are plentiful.

Pisidium ferrugineum Prime

1851. *Pisidium ferrugineum* Prime. Boston Proc., p. 162.
1865. *Pisidium ferrugineum* Prime. Mon. Amer. Corb., Smith. Misc. Coll. 145: 71.
1894. *Pisidium (Fossarina) hibernicum* Westerlund. Nachrichtsbl. Deutsch. Malak, Gesell. 26: 205.
1899. *Pisidium medianum* Sterki. Nautilus 13: 10.
1903. *Pisidium costatum* Sterki. ibid. 17: 22.
1916. *Pisidium vexum* Sterki. Prelim. Cat. N. A. Sphaeriidae. Ann. Carnegie Mus. 10. 3–4. 16: 461.
1922. *Pisidium pilula* Sterki. Some Notes on Sphaeriidae with Descriptions of New Species. ibid., 13. 3–4. 1921: 437.

Pisidium depressum Sterki. This is a label name but, lest it be in circulation, I list it.

Good forms: Form *medianum* Sterki. Form *costatum* Sterki. Form *hibernicum* Westerlund.

PISIDIUM OBTUSALE C. Pfeiffer

1821. *Pisidium obtusale* C. Pfeiffer. Naturg. Deutsch. Moll. p. 125.
1851. *Pisidium ventricosum* Prime. Boston Proc. 4: 68.
1851. *Pisidium rotundatum* Prime. ibid. 164.
1865. *Pisidium ventricosum* Prime. Mon. Amer. Corb., Smith. Misc. Coll. 145: 72.
1865. *Pisidium rotundatum* Prime. ibid. 72–73.
1896. *Pisidium vesiculare* n. sp. Sterki. Nautilus, 10: 20–21.

Form *ventricosum* Prime. Form *lapponicum* Clessin.

PISIDIUM MILIUM Held

1836. *Pisidium milium* Held. Isis. Coll. 281. [Fide Clessin, Malak. Blätt. 18, 1871: 190.]

PISIDIUM CONVENTUS Clessin

1877. *Pisidium conventus* Clessin. Malak. Blätt. p. 181.

PISIDIUM LILLJEBORGI Clessin

1886. *Pisidium lilljeborgi* Clessin. Esmark & Hoyer, Malak. Blätt. N.F. 8: 119.
1896. *Pisidium scutellatum* Sterki. Nautilus 10: 66.
1928. *Pisidium scutellatum* Sterki, form *cristatum* Sterki. ibid. 42: 25.

Form *cristatum* Sterki.

PISIDIUM SUBTRUNCATUM Malm

1855. *Pisidium subtruncatum* Malm. Götheborgs K. Vet. & Vitt. Samh. Handl. 3: 92.

PISIDIUM SUPINUM A. Schmidt

1850. *Pisidium supinum* Schmidt. Zeitschr. f. Malakozool. 7: 119.

PISIDIUM HENSLOWANUM (Sheppard)

1825. *Tellina henslowana* Leach MS.: Sheppard. Trans. Linn. Soc. 14: 150.

PISIDIUM PUNCTATUM Sterki

1895. *Pisidium punctatum* Sterki. Nautilus 8: 99–100.
1918. *Pisidium tenuilineatum* Stelfox. Jour. of Conch. 15: 296–298.

PISIDIUM AMNICUM (Müller)

1774. *Tellina amnica* Müller. Verm. Hist. 2: 205.
1832. *Pisidium amnicum* Müller: Jenyns. Trans. Camb. Phil. Soc. 4: 309.

PISIDIUM COMPRESSUM Prime

1851. *Pisidium compressum* Prime. Bost. Proc. 4: 164.
1865. *Pisidium compressum* Prime. Mon. Amer. Corb., Smith. Misc. Coll. 145: 64–66.

PISIDIUM VARIABLE Prime

1851. *Pisidium variabile* Prime. Bost. Proc. 4: 163.
1853. *Pisidium cicer* Prime. Ann. N. Y. Lyc. 6: 65.
1865. *Pisidium variabile* Prime. Mon. Amer. Corb., Smith. Misc. Coll. 145: 66.
1865. *Pisidium compressum cicer* Prime. ibid. 145: 65.
1913. *Pisidium furcatum* Sterki. Nautilus 26: 118.
1923. *Pisidium probum* Sterki. ibid. 37: 18.

PISIDIUM AEQUILATERALE Prime

1852. *Pisidium aequilaterale* Prime. Boston Jour. 6: 366.
1865. *Pisidium aequilaterale* Prime. Mon. Amer. Corb., Smith. Misc. Coll. 145: 63–64.

PISIDIUM INSIGNE Gabb

1868. *Pisidium insigne* Gabb. Amer. Jour. Conch. 4: 68.
1900. *Pisidium imbecille* Sterki. Nautilus 14: 5.
1901. *Pisidium monas* Sterki. ibid. 14: 100.
1916. *Pisidium abortivum* Sterki. Prelim. Cat. of N. A. Sphaeriidae. Ann. Carnegie Mus. 10. 3–4. 16: 469–470.
1922. *Pisidium notophthalmi* Sterki. Some notes on Sphaeriidae with descriptions of new species. Ann. Carnegie Mus. 13. 3–4. pp. 434–435.

Pisidium adamsi Prime

1851. *Pisidium adamsi* Prime. Stimp. Moll. New Engl. 16.
1865. *Pisidium adamsi* Prime. Mon. Amer. Corb., Smith. Misc. Coll. 145 : 63.
1901. *Pisidium affine* Sterki. Nautilus 15 : 66–67.
1901. *Pisidium sargenti* Sterki. ibid. 15 : 67–69.
1912. *Pisidium sphaericum* Sterki. ibid. 26 : 8–9.
1916. *Pisidium adamsi affine* Sterki. Prelim. Cat. N. A. Sphaeriidae. Ann. Carnegie Mus. 10. 3–4. p. 454.
1922. *Pisidium deflexum* Sterki. Some notes on Sphaeriidae with descriptions of new species. Ann. Carnegie Mus. 13. 3–4. p. 429.

Form *affine* Sterki. Form *deflexum* Sterki.

Pisidium fallax Sterki

1896. *Pisidium fallax* Sterki. Nautilus 10 : 20.
1899. *Pisidium kirklandi* Sterki. ibid. 13 : 11.

Form *kirklandi* Sterki.

Pisidium mainense Sterki

1903. *Pisidium mainese* Sterki. Nautilus 17 : 21.

Pisidium walkeri Sterki

1895. *Pisidium walkeri* Sterki. Nautilus 9 : 75.

Pisidium idahoense Roper

1890. *Pisidium idahoense* Roper. Nautilus 4 : 35.

Form *indianense* Sterki.

Pisidium dubium (Say)

1816. *Cyclas dubia* Say. Nicholson's Encycl.
1820. *Cyclas equalis* (*Phymeroda equalis*) Rafinesque. Ann. Gen. Sci. Phys. Bruxelles, p. 319.
1841. *Pisidium abruptum* Haldeman. Proc. A. N. S. Phila., p. 53 (Elk River, Md.).

1852. *Pisidium dubium* Gould. Prime, Bost. Jour. N. H. 6 : 254.
1865. *Pisidium virginicum* Bourguignat. Prime, Mon. Amer. Corb., Smith. Misc. Coll. 145 : 61.
1916. *Pisidium virginicum* (Gmelin). Sterki, Prelim. Cat. N. A. Sphaeriidae. Ann. Carnegie Mus. 10. 3–4. p. 446.

(See Nautilus 59 : 86–87, for Pilsbry's statement about above.)

Pisidium cruciatum Sterki

1895. *Pisidium cruciatum* Sterki. Nautilus 8 : 97.

Pisidium singleyi Sterki

1898. *Pisidium singleyi* Sterki. Nautilus 11 : 112–114.

Pisidium ultramontanum Prime

1865. *Pisidium ultramontanum* Prime. Mon. Amer. Corb., Smith. Misc. Coll. 145 : 75.

The following 'species' have too few specimens or are too badly mixed for the writer to make any pronouncement about them at the present time.

1900. *Pisidium peraltum* Sterki. Sometimes listed under *fraudulentum*. Nautilus 14 : 5.
1903. *Pisidium ohioense* Sterki. ibid. 17 : 20.
1905. *Pisidium limatulum* Sterki. ibid. 18 : 108.
1912. *Pisidium fraudulentum* Sterki. ibid. 26 : 95.
1922. *Pisidium limpidum* Sterki. Some notes on Sphaeriidae with descriptions of new species. Ann. Carnegie Mus. 13. 3–4. p. 433.

Conclusion.—This is a revised list of *Pisidium* species with some reasons for such a revision.

A description of the characters the author uses in determining these species, with drawings, is in process of preparation. A similar treatment of *Sphaerium* and its subgenus, *Musculium,* is also in process.

A Selected Bibliography

Herrington, H. B. 1950. Sphaeriidae of Athabaska and Great Slave Lakes, Northwestern Canada. Can. Field Nat. 64 : 25–32.

Odhner, Nils Hj. 1921. Mollusca. Pisidium conventus Clessin (P. Clessini Surbeck, partim). Report of the scientific results of the Norwegian Expedition to Novaya Zemlya, 1921. Videnskapsselskapet I Kristiana. 6: 1–6.

——. 1951. Swedish high mountain Mollusca. The mountain fauna of the Virihaure area in Swedish Lapland. Lunds Universitets Arsskrift N. F. Avad. 2 Bd. 46. Nr. 2: 26–35.

Prashad, B. 1925. Notes on Lamellibranchs in the Indian Museum. Indian species of the genus *Pisidium*. Records of the Indian Museum. 27. Part 5: 405–422.

Prime, Temple. 1865. Monograph of American Corbiculadae. Smith. Misc. Coll. 145.

Sterki, Victor. 1916. A Preliminary Catalogue of the North American Sphaeriidae. Ann. Carnegie Mus. 10. No. 3&4. 16: 429–474.

Woodward, B. B. 1913. Catalogue of the British species of Pisidium. Coll. Brit. Mus. (Nat. Hist.).

NOTES AND NEWS

The St. Petersburg Shell Show was held February 11 to 18, in the clubhouse of the Rod and Gun Club, on Lake Maggiore, southern St. Petersburg. The large room was crowded with cases containing about forty exhibits of Floridan and foreign shells. The Smithsonian Award, a handsome plate of *Amphidromus* suitably framed, was awarded to Mr. and Mrs. Dan Steger of Tampa, for their fine collection of deep water Gulf shells. About all the newly described species, as well as many known only from the "Blake" and earlier explorations, are represented in this scientifically valuable collection, which was all dredged by the Stegers. Although impossible in our space to mention the many meritorious exhibits, mention is made of the largest series of a single family, Volutidae, by Frank G. Lowerre, who also exhibited a very perfect specimen of the rare *Strombus goliath*, from Brazil. Land shells were neglected, the only exhibit being Ernest Klein's beautiful series of the New Zealand genus *Paryphanta*.

The judges were Axel A. Olsson, Maxwell Smith and the writer. Points used in judging were attractiveness of arrangement, scientific or educational interest, accuracy of labelling and apparent amount of work involved.—H. A. P.

GALEODES, BUSYCON AND MELONGENA.—In the issue of the Nautilus, vol. 67, no. 2, p. 63, 1953, W. K. Emerson has used the family name of Galeodidae to include (cf. Thiele) the genera *Busycon* and *Melongena* (Schumacher). However, this family name is invalid as it is based upon *Galeodes* Röding 1798, non *Galeodes* Olivier 1791 (Arachnida). The first available name for *Galeodes* Röding is *Melongena*. Both Melongenidae and Busyconidae have been used to include these genera, either together or separately. If both genera are included in one family, the name should stand as Melongenidae, replacing Galeodidae. There are many valid reasons, particularly on the basis of the shell structure, why these two genera should remain in separate families.—W. J. CLENCH.

PARAMIELLA, **new name** for *Paramia* Clench (1949, Bull. 196, B. P. Bishop Museum, p. 25) non *Paramia* Bleeker, 1863 (fish). Mr. G. P. Whitley of the Australian Museum, Sydney, has kindly called my attention to the fact that I had overlooked a previous use of the name *Paramia*. My use of the name was for a genus of cyclophorids limited to the islands of Truk in the Caroline Islands.—W. J. CLENCH.

NEW SUBGENERIC NAMES IN HELICINIDAE.—Because the following rather well marked groups of species have preoccupied names, which many taxonomists would date from me since Wagner probably used them simply as groups of the species named, I perhaps shall be excused for the following replacements:

Calidviana, **new name** for *Callida* A. J. Wagner, 1908, Conch. Cab. (2), lief. 530, p. 113, or H. B. Baker, 1922, Proc. Acad. Nat. Sci. Philadelphia, v. 74, p. 60. Not Agassiz, 1846. *Type Eutrochatella* (*Microviana?*) *calida* = *Helicina c.* Weinland, 1862, Malak. Bl., v. 9, p. 91, from Crooked Island, Bahamas.

Penisoltia, **new name** for *Hispida* A. J. W., 1907, op. cit., lief. 522, p. 54, or H. B. B., 1922, op. cit., p. 46. Not Bate, 1868. Type *Alcadia* (*s.s.*) *hispida* = *Helicina h.* Pfeiffer, 1839, Wiegm. Arch. Naturg. I, p. 355, from near Matanzas, Cuba.

Pseudoligyra, **new name** for *Tenuis* A. J. W., 1910, op. cit., lief. 544, p. 302, or H. B. B., 1922, op. cit., p. 50. Not Barrande, 1881. Type *Helicina* (*Tristramia*) *tenuis* Pfeiffer, 1849, Proc. Zool. Soc. London, 1848, p. 124, from Mexico.

Weinlandella, **new name** for *Mamilla* A. J. W., 1907, op. cit.,

lief. 522, p. 71, or H. B. B., 1922, op. cit., p. 47. Not Fabricius, 1823. Type *Alcadia* (*Idesa*) *mammilla* Weinland, 1862, Malak. Bl., v. 9, p. 197, from the island of Haiti.—H. Burrington Baker.

PUBLICATIONS RECEIVED

Shell Album. By Helen S. O'Brien. 33 pp., 12 color post-cards. O'Brien Color Studio, P.O. Box 1691, Fort Myers, Fla. $1.75. 1953.—This loose leaf folder is the first of a series. It includes beautiful color photographs of about 160 species, with key outlines which refer to brief descriptions, and notes on collection and preparation of shells. It should be very useful for amateurs.—H. B. B.

Die Bänderschnecken. By F. A. and Maria Schilder. 92 pp., 8 text-figs., 33 maps. Gustav Fischer, Jena. DM 20. 1953. —This detailed study of variation in coloration, size, form and shell-thickness of *Cepaea hortensis* and *C. nemoralis* from the island of Hiddensee, Germany, is founded on 72,000 shells from 322 localities. The authors decide that a clear picture of the variations and their relative abundance in each species would require collection of at least 200 examples spread over about one square block (1 hectare) during at least 2 or 3 successive years, and repetitions of such sampling every ⅓ mile (½ km.) over continuous ranges and also ecologically and zoögeographically isolated areas. Since great differences appear even in neighboring colonies, the island population is not in balance, which means Hardy's law can not be applied directly to such a natural distribution. A similar study of the color-variants of *Liguus fasciatus* might be very valuable, especially if it could (?) be continued for a decade or more.—H. B. B.

Praktikum der Weichtierkunde. By S. H. Jaeckel. 87 pp., 21 text-figs. Gustav Fischer, Jena. DM 5.20. 1953.—This little manual gives keys to the major groups of Mollusca (down to orders), directions for collection, preservation, preparation of radulae, dissection and histologic studies, and includes a brief glossary of common technical terms. It is written especially for amateurs, but its author hopes, with good reason, that it also may be useful to professional students.—H. B. B.

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University of Pennsylvania

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